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BRIEFLY TOLD.

OBITUARY, MR. PAUL S. MERRIFIELD.—In our last issue we noted the sudden death of Mr. Paul S. Merrifield, Treasurer and Secretary of the American Meter Company, which sad event occurred at his home, No. 19 Third Place, Brooklyn, N.Y., on Saturday, May 12th. His demise was startlingly sudden, he having only a day or so before it completed his arrangements to attend the Cleveland sessions of the Western Gas Association; and is to be attributed to acute Bright's disease, developed by a cold. In accordance with our promise of a week ago, we print the following history of his life.

Paul Sabbaton Merrifield was born in Albany, N.Y., on March 3d, 1858, and was the son of Richard Merrifield (well known in the gas business some 20 years ago) and Josepha Sabbaton, his mother being the daughter of Paul A. Sabbaton, and consequently the sister of F. A., Jos., and Tyler Sabbaton, a trio who made a lasting impression on the gas history of their time. Shortly after the birth of Paul, the Merrifield family removed to New York city, and here the subject of our sketch received a thorough preparation for a course in the Rensselaer Polytechnic Institute, of Troy, New York, from which he subsequently graduated, in 1878. Shortly afterwards he accepted a position under his uncle, Mr. F. A. Sabbaton, acting as Assistant Superintendent of the Troy Gas Light Company, which position he most acceptably filled until the close of 1882, resigning from the Troy Company's service to take a subordinate position in the Amercian Meter Company's works, in this city. His knowledge of the gas business, admirably supplemented by his training at the Polytechnic Institute, well fitted him for his new duties, which at the start placed him under the immediate direction of the Superintendent of Manufactures—Mr. William N. Milsted. His course was such, in the inevitable changes which occur in the management of a large corporation, as to commend him to the notice and confidence of his superiors; and they, in October, 1892, named him to the responsible places of Secretary and Treasurer of the Company, where death found him. Mr. Merrifield's other active connection with the gas business was that of Vice-President and Director in the Glens Falls (N. Y.) Gas Light Company, and in the Directorate of the East Albany (N. Y.) Gas Light Company. He was also a member of the American Gas Light Association, which body he joined during the sessions of 1879. In 1891 he was united in marriage to Miss Fannie A. Clarke, of this city, who survives him, as do two infant daughters. Deceased was a man of reticent disposition, but of kindly ways, and his memory will live long in the minds of those who were closely associated with him. As said in our issue of a week ago, the funeral services were held at his late residence, on the afternoon of the 15th inst., and the interment was made in Greenwood Cemetery.

RESOLUTIONS ADOPTED BY THE NEW YORK MUTUAL GAS LIGHT COMPANY RESPECTING THE MEMORY OF THE LATE MR. H. F. ALLEN.—For the following account of the action taken by the Directors of the New York Mutual Gas Light Company, respecting its late Superintendent, Mr. Henry F. Allen, we are indebted to the courtesy of Mr. E. S. T. Kennedy:

"At a regular meeting of the Board of Directors of the New York Mutual Gas Light Company, held in the city New York, on May 15th,

1894, the following preamble and resolutions were unanimously adopted:

"*Whereas*, This Board has learned with deep sorrow of the death of its late Superintendent of Works, Mr. Henry Frederick Allen, who had faithfully and capably fulfilled the duties of that position for more than 16 years; therefore, be it

"*Resolved*, That Mr. Allen was a gentleman of the highest integrity, a remarkably able mechanical engineer, who possessed such complete mastery of his profession as to be undoubtedly one of the ablest practical men in the gas industry. His abilities were recognized by all his associates in the profession, and his genial and modest manner and cheerful disposition secured to him the friendship of all who had the pleasure of knowing him.

"*Resolved*, That we recognize with sorrow the great loss sustained, not only by this Company, but by his family and numerous friends, and that we tender to his family our sincere sympathy in their bereavement.

"*Resolved*, That these resolutions be entered upon the minutes of this Board, and that a suitably engrossed copy thereof be sent to the family of the deceased.

R. M. Gallaway,
C. C. Leary,
E. S. T. Kennedy,
} Committee."

The Cleveland Meeting.—We cannot add much to our telegraphic correspondence of a week ago respecting the Western's meeting at Cleveland, save to say that that which was said about it a week ago is equally true now. The really disagreeable feature of the convention—perhaps we might better say "disturbing" instead of "disagreeable"—was the positive declination of Mr. Littleton to accept a re-election to the offices of Secretary and Treasurer, which have been so admirably carried on for a good, round term of years by him. However, his wishes *had* to be respected, and his *real* reasons for putting aside the burden admitted of no overturning. He knows that the Association has valued his services, always unremitting in its behalf and sustained for its advancement, at their true worth, and that no other honor which it could confer but is his for the asking. Another feature of the meeting was the development of a new personal factor, in the person of Mr. S. M. Highlands, of Clinton, Ia., who had much to say, and who said all of it well. Of course, he is not to be taken seriously in the references made by him, in the discussion on his paper, to the effect that savings in pounds of coal and in gallons of oil in the generati g department of a gas works are not worthy of especial consideration; for later on he naively qualifies that jocosity by remarking in effect that while he was seeking consumers some one in the works was looking closely after the aforesaid pounds and gallons. Mr. Thompson's report from the Committee on Electrolysis—it will be found in full on other pages of this issue—was fully up to that gentleman's standard for careful research and intelligent digestion of the results of such research, and is likely to be quoted for many a day as the law bearing on the subject. His codification of it was admirable. As we said last week, the meeting was in all respects a brilliant success.

The Pacific Coast Gas Association Meeting.—The Sacramento meeting of the Pacific Coast Gas Association was brought off with great success, at Pythian Castle, Sacramento, Cal., on the appointed days. The paper list covered six numbers, and the question box also contributed its quota to the intellectual entertainment. Ten new members—including Mr. Chas. Dickey, of Baltimore—were added to the lists. The officers chosen were: President, C. W. Quilty, of San Jose; Vice President, F. H. Eichbaum, of San Francisco; Secretary and Treasurer, J. A. Britton, of Oakland. The next meeting will be held in San Francisco, on July 14 and 15, 1895. The social feature was an elegant banquet at the Maison Faure, and the Capital Gas Company enacted the part of host in most agreeable fashion. The Association also visited in a body the celebrated Folsom dam, now in process of construction. The attendance was excellent, and the interest in the meeting was well sustained.

Notes.—Mr. Chas. L. Gerould, formerly in charge of the Peoples plant, of Brooklyn, N. Y., has been appointed Superintendent of the American Gas Company's plant at Mount Vernon, N.Y., and Mr. F. B. Wheeler, formerly of Mount Vernon, is now in charge of the American Company's latest venture, at Schenectady, N. Y.——We are more than pleased to say that our information (printed in our issue for May 14) respecting the placing of the Helena (Mont.) Electric Light Company in the hands of a receiver was inaccurate. This Company is virtually a part of the local Gas Company, although each corporation retains nominally its individuality, and each is enjoying a goodly share of prosperity.

[Official Report.—Revised by the Secretary.—Continued from page 735.]

SEVENTEENTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

Held at Cleveland, Ohio, May 16, 17 and 18, 1894.

First Day—Morning Session.

The President announced the next thing in order would be the

Report of Board of Directors.

which the Secretary read as follows:

Cleveland, O., May 15, 1894.

A regular annual meeting of the Board of Directors of the Western Gas Association was held this morning, at 10 o'clock, at the Hollenden, Cleveland, O., with the following members present: E. H. Jenkins, I. C. Baxter, Wm. McDonald, Jas. Ferrier, Geo. T. Thompson, B. A. Ward, A. W. Littleton. The chair was occupied by E. H. Jenkins, and A.W. Littleton served as Secretary.

On motion of Mr. Ward, the reading of the minutes of the last meeting of the Directors was dispensed with.

The Board examined the following papers, which have been prepared for presentation at the Seventeenth Annual Meeting of this Association, and, on motion of Mr. Baxter, it was ordered that the same be read in due course:

"Three Years in a Country Gas Works," by S. M. Highlands.
"How to Make Small Electric Light Plants Pay," by I. C. Copley.
"Influence of Temperature on Purification," by Jas. Ferrier.
"Some of the Advantages of Oil Gas Works for Small Towns," by J. W. Stratton.
"Street Main Pressure," by Irvin Butterworth.
"History of the Gas Meter," by William McDonald.
"Best Method of Introducing Gas Stoves," by H. Wilkiemeyer.
"Wrinkle Department," by George T. Thompson.
"Report of the Committee on Electrolysis."

The Board appointed Messrs. I. C. Baxter, B. A. Ward and B. E. Chollar a committee to audit the accounts and examine the books of the Secretary-Treasurer, and report thereon to the Association.

Messrs. William McDonald, James Ferrier and George T. Thompson were appointed to examine and report on applications for membership.

On motion of Mr. Thompson it was unanimously ordered that the Board of Directors recommend to the Association that the new Constitution and By laws, submitted at our Chicago meeting of 1893, be adopted at our forthcoming meeting; and if it should be the desire of any of our members that alterations or amendments should be made thereto, that the same be presented at this meeting for consideration one year hence.

On motion of Mr. Ferrier it was carried that the Board recommend to the Association that the business sessions of the convention shall be called to order at 9:30 A.M. and 2 o'clock P.M., and that this announcement shall be duly made on the bulletin board in the hotel office.

The Board further recommend that at 11:30, on the morning of the first day of the meeting, the Association shall adjourn to visit in a body the exhibit of gas appliances, which has been prepared for our instruction and entertainment.

On motion, the Board here adjourned, to reconvene at the call of the President.

A. W. Littleton, Secretary.

The President—You have the report of the Board of Directors before you. What will you do with it?

Mr. Somerville moved that the report be received and adopted, and the President, in answer to a question by Mr. Lansden, having said that the adoption of the report would mean the adoption of the new Constitution and By-Laws, the motion to adopt prevailed.

Appointing the Special Committees.

The President named the following committees:

On President's Address.—I. C. Baxter, James Somerville and B. E. Chollar.

On Nomination of Officers.—George G. Ramsdell, Chas. R. Faben, Jr., J. B. Howard, J. T. Lynn and W. L. Brown.

On Place of Next Meeting.—E. G. Cowdery, Robert Young, Joseph Gwinn, H. W. Douglas and George T. Thompson.

On Obituary Resolutions.—Thomas G. Lansden, F. W. Freese and W. M. Eaton.

The President having said that although applications for membership would go over until to-morrow, all those who made application

should consider themselves entitled to take part in the sessions, and then called for the

REPORT OF THE SECRETARY-TREASURER,

which was read by Mr. Baxter, of the Auditing Committee:

QUINCY, ILLS., May 1st, 1894.

Receipts.

To membership fees	$100 00	
Annual dues	854 00	
Sale of badges	38 00	
Balance from May 1st, 1893	341 21	
		$1,333 21

Disbursements.

By Secretary's salary	$400 00	
Sundry bills, as per vouchers	537 40	
Balance, cash on hand, May 1, 1894.	395 81	
		$1,333 21

Approved by Auditing Committee, ISAAC C. BAXTER, B. A. WARD.

On motion of Mr. Odiorne, the report was received and placed on file.

A GREETING FROM THE PACIFIC COAST ASSOCIATION.

The Secretary read the following telegram:

SACRAMENTO, CAL., May 15, 1894.

To A. W. LITTLETON, Secretary Western Gas Association, Hollenden, House, Cleveland, Ohio:

The infant, the Pacific Coast Gas Association, meeting to-day, sends greetings to the Western Gas Association. JOHN A. BRITTON, Sec.

On motion of Mr. Somerville, seconded by Mr. Gwynn, the Secretary was instructed to send a greeting from this Association to the meeting of "The Infant."

REPORT FROM COMMITTEE ON CONSTITUTION AND BY-LAWS

The President—The next thing on the programme is reports from standing committees. The report from the Committee on Constitution and By-Laws ought properly to come before the meeting, and the new Constitution and By-Laws be read. Although we have practically adopted it already, yet I think we ought to know exactly what there is in the new measure. I will, therefore, ask the Chairman of the Committee, Mr. Ramsdell, to read it.

[Mr. Ramsdell then read the Constitution and By-Laws submitted at the last annual meeting, for which see AMERICAN GAS LIGHT JOURNAL, May 29, 1893, p 777.]

Mr. Ramsdell—I move the adoption of the Constitution and By-Laws.

The President—You have heard the reading of the Constitution and By-Laws, and the motion of Mr. Ramsdell. The matter comes up now for final adoption. The report was carefully considered by the Committee a year ago, referred to the Committee to report thereon at this time, and the recommendation of the Board of Directors that it be adopted as read has been acted upon. If any further amendments are proposed at the present time the matter would have to lie over another twelve months.

Mr. Lansden—I understood that the Constitution was adopted before it was read.

The President—It practically was adopted by the resolution adopting the report of the Board of Directors; but I felt that in fairness to the members here, and so that there might not be any snap judgment about it, the Constitution and By-Laws should be read. If this motion by Mr. Ramsdell goes through it stands just as it did before, or you can amend it at any time during this meeting; but proposed amendments would have to lie over. If there is no further discussion desired I will put the question. (The motion prevailed; and on motion of Mr. Cowdery, seconded by Mr. Baxter, the Committee was discharged with the thanks of the Association.)

The President—The recommendation of the Board of Directors is that we attend in a body the exhibit of gas appliances to day. The time for adjournment for that purpose is nearly at hand, but as we have about 20 minutes yet, I would suggest the Secretary read one or two of the questions from the Question Box, so that the time may be profitably occupied.

The Secretary—The first question is:

"Where can one get market quotations on coal tar?"

The President—That is an important question to most of us, as the price of coal tar is a subject we are all interested in, and if there is any place where we can get market quotations on coal tar we shall be glad to hear of it; if not, we shall be glad to know why not.

Mr. Odiorne—The question is rather vague, because there are different qualities of coal tar. There is the imported tar and a tar produced by the blast furnaces in this country, besides the staple tars resulting from the manufacture of coal and water gas. Therefore I think it would be rather hard to answer the question. The headquarters for the Western tar, I think, is the S. E. Barrett Mfg. Co., of Chicago, who handle a large proportion of it.

The President—Can anyone else give us any information in the matter? If not, the Secretary will read the next question—

2. "Has any member had experience with electrical apparatus for gas lighting? If so, was it a success or a failure?"

Mr. Russell—Does that refer to house lighting?

The President—One would naturally suppose it referred to all cases of lighting gas by electricity.

Mr. Russell—I have had some experience in house lighting. I do not think it would apply to street lighting and be much of a success. Naturally it is necessary to use primary batteries for that; and if a man has much of a district to cover I do not think he could well use electricity for lighting purposes, because I think the lamps could be better lighted with the ordinary torch.

The President—What has been your experience in house lighting?

Mr. Russell—With house lighting, where the wiring is properly put in, and where the equipment is perfect, as far as I know or have heard, electricity can be operated very successfully. There are a number of electrical concerns which have electric gas lighting appliances, and any one of them will do it.

The President—What is the smallest number of burners in a house which could be practically fitted up with an electrical apparatus for lighting purposes?

Mr. Russell—Do you mean in one chandelier?

The President—How many in a house?

Mr. Russell—In a house having 60 or 70 jets it can be put in very cheaply. I would suggest, however, that each room be fitted for the purpose separately. I do not think that one set of batteries and wires will work very successfully for all the rooms in a house. It would be a good thing to put those up in series; and if the wires are made sufficiently large to carry the current they will not be overtaxed. If you overtax a wire, I do not care whether with dynamic electricity or with static electricity, there is bound to be a bad result. That is where the great trouble is had. Everybody tries to put things in too cheaply. The wires are too small, and therefore they do not give good results. Another thing, the batteries are very seldom properly looked after. In a town where there is no one who makes a business of wiring up houses, and no one to look after the batteries, there is some trouble probable; but if one has a proper installation, and will take care of the wires and batteries, I think it will pay him to use electricity for lighting purposes.

Mr. Highlands—As I have had some experience with house lighting by electricity, it may be of advantage to some one if I contribute an answer to that question. As you probably know, we keep a corps of electric wire men, and have to devote a little attention to house lighting by electricity. We find that our customers are well pleased with it, and that it is possible to wire a house and to light it by gas just as advantageously, and that it is as easily handled as when lighting by incandescent lamps. We wire the rooms separately—the halls and bedrooms. There are appliances for lighting the gas, just as you put in switches for turning on the incandescent lamps. We have probably 25 or 30 houses, with from 6 to 30 rooms each, that are now using it, and no one of those parties cares to use the incandescent lights in preference to gas, because they now have all the advantages of incandescent lamps with none of the disadvantages and at less expense. I am not technical enough to answer the question fully as to just how the wiring is done, but if any person cares to have the information I will forward it to him without any expense whatever. It can be made very convenient and very successful, and there is no expense to operate it except the little expense for renewal of batteries.

Mr. Butterworth—If Mr. Cline, of Springfield, O., were here he could tell you what he has told me, that in Springfield the Public Library is lighted with gas, equipped for electric lighting, and that it is very satisfactorily done and is very successful indeed.

Mr. McIlhenny—It is not only important to the gas people to make the use of gas as effective and as convenient as possible, but to every one who burns gas this is one of the greatest conveniences which you can possibly imagine. I put it into my own house and I would not be without it for anything. It is a great convenience and comfort to be able, when you are in bed, by simply touching a button, to light up your halls and rooms, so that if a burglar happens to come in you at once have decidedly the advantage of him, for he would be very much astonished. In that way I consider it not only a great convenience, but a very great safeguard. It is quite as convenient as electric incandescent lighting. You have simply to go to the wall and touch a button, and your chandelier is lighted. It is all done quickly. No matches are

required. I think anyone who burns gas—not only the gas makers but all who use it—ought to encourage everything which makes gas attractive. We ought to put the device in wherever we can. I have been surprised at the small cost. The man who attends to the batteries does it for a dollar or two a year; for they do not really require any great attention.

Mr. Penn—I have my house lit up with an electric gas lighting apparatus, but I use a storage battery, and think it is much better than other forms of battery. The other batteries are continually getting out of repair or running down; but a storage battery will last almost indefinitely. I would not be without the apparatus in my house for three times the cost of it. I consider it just as convenient as incandescent electric lighting.

Mr. Odiorne—What is the expense of the storage battery?

Mr. Penn—The battery which I use cost me $9 per cell; and as I run my own electric light plant I fill it myself.

Mr. Somerville—I understand you can light the gas with the electricity, but I have not yet understood that you could turn it off in the same way. I wish some of the gentlemen who use it would describe in a few words the modus operandi. How is it turned on, and how is it turned off? Give us some idea how it is operated. I am sure Mr. McIlhenny can tell us how it is done, and I hope he will enlighten others, who may be ignorant, like myself, about it.

The President—Can anybody give Mr. Somerville that information? It is a matter that we are all interested in.

Mr. McIlhenny—I really do not understand the construction of the wires for the electrical appliances; but to turn it on or off we simply press a key, one end of which is black and the other white. When turning it on the white end of the key is pressed, and when shutting it off the black end of the same key is pressed. The key swings on a hinge in the middle, and both ends are equally prompt in performing their duty.

The President—Do you turn the gas on and light it at the same time by simply pressing the button?

Mr. McIlhenny—Yes; the same key does both. Pressing the white end of the button turns the gas on and lights it; pressing the black end shuts the gas off as effectually as the other end lights it.

Mr. Highlands—A further advantage I think of is: We have in our city a lamp post in front of a house, probably 300 feet from the house. Three years ago that was also connected up with electric wires so that the lamp on the post could be lighted from the house. It has never since required any attention, but has been turned on and off from the hall of the house every night and morning since. How much further that system can be carried is simply a question of battery power. This lamp is controlled entirely from the battery—which is a dry battery and not a storage battery. The question of the strength of the battery is, of course, a simple matter. By adding to the cells of the battery, and thus simply increasing the voltage, you can carry its effect as far as you see fit, but of course increasing the voltage will increase the expense of the battery. In installing these at first we agreed to keep them in repair free of expense to the consumers—they paying for the installation. A complete installation for 100 burners would cost about $125, put up with a wire strong enough, and well enough insulated, to be practically indestructible; so that outside of the expense of renewing the battery, and the cost of the wiring itself, there should be no expense for years. The results have been very satisfactory wherever we have installed the apparatus. The only question at any time has been the expense of installation. It costs just about the same to wire up for the gas lighting that it does to wire up for the same number of incandescent lamps, and it is equally indestructible.

Mr. Harbison—I think the writer of that question must have had in mind the idea of the practicability of ordinary house lighting by the use of electricity. But in listening to the gentlemen who have spoken on the subject I have not observed that any of them have given any indication as to whether, for instance in this room, where there are 24 burners on the chandelier, and it was desired to light only one or two burners on each chandelier, or on any one of them, it can be done separately, or whether all the burners must be lighted. It seems to me that that is the practical point. We all have a great many more gas jets in our houses than we want to use all the time. Can the servant, in going around at lighting time, light as many burners as may be required by simply pressing a button, or must all the jets be lighted, and then go around and turn off a certain number? Will some one who has had experience tell us a little more definitely with regard to that, and whether it is practicable to so arrange it?

Mr. Highlands—In answer to that question, the burners are put on wires in series, and the current going first to one, follows right through the series; and when you turn it on by pressing the button it will light all the burners in that series. If you wish to light but one or two burners you must have a separate wire for those one or two burners.

The President—You can readily see how we can make the question box a very profitable institution if we try. We have one more question which may be answered before the recess—

3. "A gas works has a holder located a block away from the plant. How can the movement of the holder be best indicated in the office?"

Will some one answer that question? If Mr. Joseph Light is in the room I think he can answer it.

Mr. George Light—Joseph Light is not here, but I think I can answer that question. It is done by a wire run from the holder, and then simply reduced by pulleys into a dial. We have had that device in use for eight years, and have never had any trouble with it. Its operation is entirely satisfactory. It is done on the relief holder of a water gas plant, to tell the water gas man what he is making. The scale is divided up as low as 500 feet.

Mr. Thompson—Has Mr. Light ever had any difficulty with that attachment because of sleet?

Mr. Light—Never.

Mr. Harper—Some time ago I saw a very useful plan of that kind in the case of a New York company. It was arranged something like a switchboard for a number of incandescent lamps. The lamps were of different color, and indicated by the color the height of the holder. Upon every movement of the holder the lamps would put themselves in evidence at once. It struck me as being a peculiarly complete way of getting over the difficulty.

Mr. Thompson—I have seen another manner of indicating the height of movement of the holder, but not in this country—I wish to ask if any member knows of its being applied in America?—that consists of a large bowl carried on the crown of the holder, at the edge, from which a pipe carries a stream of glycerine through an underground pipe to a gauge at a convenient point in the office. The large bowl is of so much greater size and capacity than the pipe itself, that the height of the holder cuts very little figure in the height of the liquid in the bowl; but the pressure due to that additional height is so considerable that a delicate gauge would perfectly indicate every movement of the holder. That gauge was applied at a distance of over 300 feet from the holder.

Mr. Highlands—I do not believe that a gas man should be very much of an advocate of the use of electricity, neither should he entirely ignore it; but the question of harnessing it and putting it where it can do your work easily, conveniently and cheaply, comes up so frequently in gas works that I do not think we can properly ignore it. I wish simply to say, regarding an apparatus of that kind to be put up cheaply, I would use the ordinary house bell attachment which we put up in our kitchens to show the locations of the rooms in the house, and I would put a wire with necessary attachments on a column of the holder and let the holder make a contact with that. It would cost, probably, $5 to put it up, and then would cost nothing to keep it in order.

The Association then took a recess until 2 o'clock P.M., and the members in a body visited the exhibit of gas appliances.

First Day—Afternoon Session.

Report of Committee on Nomination of Officers.

Mr. Ramsdell—Your Committee on the Nomination of Officers begs leave to submit the following report:

President—I. C. Baxter, Detroit, Mich.
First Vice-President—W. H. Odiorne, Springfield, Ills.
Second Vice-President—S. M. Highlands, Clinton, Ia.
Secretary and Treasurer—J. W. Dunbar, New Albany, Ind.
Directors—E. H. Jenkins, Columbus, Ga.; J. W. Stratton, Valparaiso, Ind.; William McDonald, Albany, N. Y.; Geo. T. Thompson, St. Louis, Mo.; Irvin Butterworth, Columbus, O.; William M. Eaton, Jackson, Mich.; Robert Young, Allegheny City, Pa.; James Forbes, Chattanooga, Tenn.; H. Merrill, Janesville, Wis.

I wish to say to the members of the Association, with regard to the nomination for Secretary-Treasurer, that your Committee has exhausted every effort that it was capable of using in the endeavor to continue Mr. Littleton in that office. We all know that he has been an exceedingly and unusually faithful officer, that he has been untiring in his loyalty to the Association, and in the courtesy of his treatment of the members. I know you will all feel with me a keen regret that Mr. Littleton leaves the position which he has so long held; but he has given the Committee satisfactory reasons why he should be relieved at this time, and the Committee has had no other course, therefore, than to select a gentleman

who will, I think, meet with your approbation, as his selection met with the approbation of the Committee.

ELECTION OF OFFICERS.

On motion of Mr. Ramsdell, seconded by Mr. Littleton, Mr. Geo. T. Thompson was instructed to cast the ballot of the Association for the election of the nominees; and having done so they were declared by the President to be duly elected as officers for the ensuing year.

Mr. Somerville—Mr. President, I don't much like this sort of thing. Is it not possible to induce our Secretary to continue in office? We members are taken very much by surprise. The thing has been done so quickly that I almost wish we could reconsider the motion.

The President—It is of course rulable to move to reconsider.

Mr. Somerville—I don't know whether it would be of any use to make that motion; but if it can be done I think something certainly ought to be done or said in recognition of the long, faithful and efficient service of our esteemed and worthy Secretary, Mr. Littleton. I hate to part with him in this way. I am not good enough speaker to say what I would like to say about it.

The President—I will say that the Chair is here to execute the wishes of the meeting. I confess I am quite as much taken by surprise as other members seem to have been. I am ready to entertain any motion you wish to make.

Mr. Ramsdell—I might say in connection with this matter that Mr. Littleton has no warmer friend in the room than I am. This matter was brought to my attention two months ago. I was then pledged to secrecy about it. After exhausting every argument I could bring to bear upon him, and trying in every way to get Mr. Littleton to reconsider his decision, I finally agreed to take the course I have just taken, for I know from what Mr. Littleton has told me that it would be impossible for him to continue in the office. I think it would be not only well, but there should be a committee appointed to prepare suitable resolutions expressing our respect and confidence in Mr. Littleton. At the same time I think it would be quite useless for us to try to change him in the decision which he has made.

Mr. Dunbar—I move that a committee be appointed to prepare a set of resolutions expressive of our appreciation of the services of our retiring Secretary-Treasurer.

The motion was carried and the President subsequently appointed as such committee: J. B. Howard, B. E. Chollar and C. R. Faben, Jr.

REPORT OF THE COMMITTEE ON ELECTROLYSIS.

Mr. Geo. T. Thompson, Chairman of the Committee on Electrolysis, read the following report:

Your Committee, to whom was referred the matter of electrolytic corrosion of gas and water pipes by the return currents of electrical street railways, submit the following report as the result of their investigations:

A thorough appreciation of the principles of electrolysis being necessary to the proper explanation of the effects observed, your committee may be pardoned for repeating some details which may be already familiar. Practical employment of the phenomenon of electrolysis is made in electro-plating, in the Edison electric meter, in the reduction of aluminum and other metals from their oxides, in the purification of sewage, etc., but the condition of its application most similar to that which we are now considering is exhibited in the well-known laboratory experiment of analyzing water by the passage of an electric current between poles immersed in the acidulated liquid, for electrolysis literally means a loosening or dissolving by electricity. These poles are called *electrodes*, the positive pole being the *anode* and the negative the *cathode*, while the liquid is termed the *electrolyte*. In the instance cited, if the object of the experiment were the production of hydrogen and oxygen, platinum poles would be employed; but if a more easily oxidizable substance were used for the electrodes, the conditions present in the analogous system of electro-plating would be produced—that is, there would be a perceptible wasting away of the substance of the positive pole, and a gradual accretion at the cathode or negative terminal. The electrolyte must be a compound substance, and in a liquid state, either by solution or fusion. When a salt is electrolyzed, the acid always appears at the positive pole and the base at the negative. In the case of water, the collection of the hydrogen at the negative pole is but another instance of its metallic behavior, and the oxygen always collects at the positive pole.

Turning now to the phase of electrolysis which we have to consider, we may briefly summarize its history by remarking that telegraphic practice had led electricians to think the earth's resistance practically nothing; hence in the earlier electric traction installations, no special attempts were made to provide for returning the currents to the power houses. But the necessity for such provisions was soon apparent, and a form of bond-wire for connection at rail-joints was introduced, the tracts being relied upon as return conductors. The use of a supplementary wire between the tracks, larger bond wires, and more attention toward securing electrical contact, followed, but with increased experience in electric railway work, came the realization that these attempts had been little better than make-shifts, and that owing to imperfections and consequent resistance, a large proportion of the current was seeking other avenues of return, and was causing injuries by so doing.

The realization of this condition by no means came all at once, for railway managers were at first loath to believe the operation of their dynamos responsible for the reported damages to the telephone cables and gas and water pipes, but ascribed the corrosion to chemicals in the soil or other causes, and doubtless looked upon the loss of their current as a necessary evil attendant upon the method of propulsion employed. Some of the earliest experiments to locate the source of this corrosion were those[1] of Mr. I. H. Farnham, of the New England Telegraph & Telephone Company, Boston, who exposed short lengths of cable to all the conditions affecting the corroded cable except that of connection with the system of wires, and found them unaffected after an exposure during which the neighboring connected cables were badly injured. Many other tests have been made, and there is now a full agreement by both the owners of the buried pipe and wire systems and the street railway people as to the cause of the trouble, all uniting in ascribing it to the earth returns of the enormous currents used in electric traction.

Having agreed that the grounded current is responsible for the injuries we have observed, let us see the manner in which it acts. No effect is produced where the current reaches the pipes, for this is a negative electrode, and would be receiving a deposit from the rails and bond-wires, if any action were apparent. Neither is there likely to be any damage in the body of the pipe, unless a small connecting line should be encountered whose greater resistance would cause heating, or the presence of joints of higher resistance (due to leaks, or the use of cement) should force the current out, to return a few inches further on. But the injurious action occurs at the point where the current *leaves* the pipes to enter some conductor offering an easier path. This will usually take place opposite the power-house—where the current is also greatest in quantity owing to the accumulated returns from the entire line—and at points where pipes cross beneath the tracks, the current returning to the rails with especial readiness if the direction of the pipes no longer coincides with that of the railway. Here the conditions of our laboratory experiment are reproduced. Of two points where rails and pipes are equally distant, the greater flow of current will take place where the greater moisture exists. This moist earth then is our electrolyte, made specially effective by the gas, ammonia from animal refuse, salt from melting snow, or other chemicals present in the ground; the pipe is our anode; and the rail or other objective point of the current the cathode. The metal of the anode or positive pole is gradually carried in the direction of flow[2] of the current; and the electrolysis once begun, the oxygen and ozone of the electrolyzed moisture collect at the positive pole and aid in attacking the pipe. The rapidity of its destruction depends on the quantity of current passing rather than upon its voltage; and instances are on record and in the knowledge of your committee where a single month sufficed to destroy new service pipes.

Verbal expressions from several sources, as well as certain published discussions, seem to indicate that the full extent and effect of this electrolytic trouble is but vaguely realized by many of us. Some of us may think that not having found any ill effects ourselves, the question, though an interesting one, deals with a matter that does not touch *us* directly. Your committee would emphasize this statement, that no city in which an electric road is operating with any part of the return through the ground, has its gas and water pipes wholly free from electrolytic action; the fancied immunity is the security of incomplete information. To draw attention to the wide-spread nature of the trouble, a portion of the appendix accompanying this report is devoted to published accounts of damaged pipes. The greater number of complaints come from the water interests, for two reasons; first, greater conductivity, for the water mains range greater in size than gas mains, the absence of cement joints decreases their resistance, and the contained water may add to the conductivity; and second, the greater pressure carried more quickly occasions a break. But the gas mains are beginning to indicate the action upon them, and will do so more and more unless effective remedies are soon applied. When we realize not alone the immense capital buried in our water and gas distributing systems, but the fact that street improvements have made repairs to our pipes additionally expensive, we may begin to appreciate the serious character of a condition which divides by 5, 10, 50, and even 100, the life of a pipe, and which, until the cause be

1. Am. Gas Lt. Journal, Mch. 12, '94, p. 365; Western Electrician, Apr. 28, '94, p. 208; Elect. Engnr., April 25, '94, p. 372; Elect. World, Apr. 28, '94, p. 567; Elect. Review, Apr. 25, '94, p. 195; Street Ry. Gazette, Apr. 21, '94, p. 181; Electricity, Apr. 25, '94, p. 188, etc.

2. Mr. Allyn's account of the coating of a gas-pipe by lead electrolytically deposited from a water service will be found in the proceedings New Eng. Assn. Gas Engnrs., Am. Gas Lt. Journal, Mch. 12, '94, p. 364.

removed, may repeat the operation on the replaced line in an equally short time, or accomplish a similar injury at another point where its action will be less readily located.

Coming now to a consideration of the remedies, we will first notice those which have been suggested for adoption by the gas and water companies. Probably the earliest of these was that of coating the pipes with non-conducting paint or a covering of similar purpose. A parallel of this is the use of drain pipes of slightly greater diameter than the metal ones, slipped over the latter and cemented at the joints and at ends. These have been adopted with especial convenience for service pipes crossing under the rails, but their value is dependent upon the local circumstances. If the corrosion at such a place is caused by the current flowing downward through the earth and so entering and leaving the service at about the same points—placing it in an electric bath, as it were—such a covering should prove a true protection. But if the current had reached the line through some imperfection at a point farther away, and caused the corrosion by leaving the pipe to return to the rail, any insulation, if locally effective, would cause the current to seek a different avenue of exit and so merely transfer the point of corrosion. A determination at such places of the direction of the current, whether from or to the rail, would show whether or not a non-conducting covering would be effective. Incidentally, the adoption of insulation at the current's points of departure would increase the resistance of the mains and so decrease the proportion of current carried, but complete relief by the plan suggested would require encasing of the entire distributing system, and as a final curative it may be dismissed as impracticable.

The same reasoning applies to the method adopted on certain lines of water pipe in Los Angeles, which were laid in conduits filled with sawdust, and also to the use which has elsewhere been made of a covering of pitch, kept in place by boxing of convenient form. All these protectives are too costly for general adoption, and no partial installation of any of them would wholly cure the trouble.

A similar statement may be made regarding the device of winding or protecting the pipes with copper wires attached to plates buried below. This was tried in Cambridge, Mass., but relinquished because of the rapid destruction of the copper ground-plates.

The paralleling of gas mains on each side of streets occupied by electric roads, that there may be no crossing service pipes, has been suggested; and in Aurora, Ill., circumstances have left the Gas Light Company with their mains thus duplicated, and hitherto no trouble from electricity has been experienced. But it would seem that while crossing mains at intersecting streets could be insulated, some electric leakage or induction must occur from the long parallel lines of uninsulated conductors, rails and pipes, thus placed comparatively close together. The British Committee on the electrolytic subject seem to regard the interposition of six feet of dry earth as a sufficient shield, but under the conditions existing in most cities the absence of moisture would be difficult to guarantee; and the great cost of such a method of protection, even if effective, would put it out of the question.

The use of cement joints for gas mains is in a measure an advantage as a protection, for any tendency to increase the resistance of our pipes is helpful so far as it goes. This remedy, though, does not apply to the water mains, and should the pipes have been connected to the dynamos or cross-bonded to the rails, as will be described later, the presence of cement joints would be a positive source of danger.

It is plainly apparent from a consideration of the foregoing devices and the conditions which limit them, that no remedy can be applied by the gas and water interests which will be wholly effective. We now come to consider the preventives whose adoption devolves upon the railway companies.

In the earlier days of the "broomstick trains," the practice as to current direction was not as uniform as it generally is now, for in some plants, the dynamos were run with the positive pole to the trolley wire, and some with the negative. In the latter cases, electrolytic effects were produced along the entire line wherever the current would find a ready path from pipes to rails, so that locating the injuries was a much more difficult task. As the car motors take current either way, however, reversing the current's direction was an easy matter—especially in places where but one electric road is operating—and has been very generally done. The liability to corrosion is thus brought to within a narrower range, and largely localized in the neighborhood of the power-houses.

Most prominent in point of number among the remedial devices adopted by the railway companies are those for securing additional electrical contact at the bonds, and obtaining a bond conductivity approximately equal to that of the rail itself. The necessity of greater attention to this latter point is shown in the tables which have been published of relative conductive areas of the several sizes of rails and bonds in use; it has been customary to bond 56-lb rails, for instance, with No. 0 B. W. G. copper wire, whose relative conductivity is but one-twentieth as great. The use of the customary sizes of supplementary wires between the rails is by this comparison shown to be equally ridiculous and ineffective; one writer remarks that it is "laying a twelve-inch water main and then putting a one-half inch pipe alongside to help it out;" and it has been well said that the weight of copper now used in supplementary ground wires would be much better employed in the form of heavier bonds. A contributor to *The Engineering Record* states that "a section H, 60-lb Lewis & Fowler box rail has about the same resistance as a copper wire one and one-eighth inches in diameter. No such amounts of copper have yet been used to make bonds, and until they have, the possibilities of rail returns have not been exhausted." The same writer refers to some experiments by Messrs. Warner & Thayer on track resistances, which showed that the resistance of the rail section was so slight that the calculated resistance of the bonds accounted for nearly all of that observed.

In order to decrease the cost of bond wires it has been suggested to make them twelve inches long instead of thirty inches, as is usually done, which would also reduce the bond resistence, and to use rails sixty or one hundred feet long instead of thirty feet. The suggested use of bonds of equal conductivity with the body of the rail and of greater rail lengths is still a step short of welded joints and continuous tracks, which have been adopted on several lines. The principal objection to the use of continuous rails has been the fear that changes in temperature would induce alterations in their length, previously allowed for by spacing between abutting joints, and that buckling or deflection of the tracks would thereby ensue. But careful tests on a practical scale seem to have shown that in a well laid track of this character linear expansion may be disregarded, and that changes in temperature produce their effects "in a minute enlargement and reduction of the sectional area of the rail."[1] Such a line of double track, three and one-half miles long, is now being laid on the North Broadway extension in St. Louis, the object of its introduction being the desire to decrease the jolting of cars by doing away with rail joints; but the manager of the roads has remarked that an incidental advantage is expected from a more efficient return of the current.

The use of the "three wire system" on electric roads has been advocated by Mr. W. Nelson Smith as a deterrent of electrolytic corrosion, and has been in operation in Portland, Ore., for the past two years, with reported success. In its application for this purpose on a double track road, the trolley wire above one track serves as the positive, the other as the negative, and the rails and earth as the neutral wire. There may be a potential difference from earth of 500 volts to each trolley wire, and of 1,000 volts between them. The rails or neutral wire merely carry the current required by the difference in load on the two sides of the line, which is only considerable when cars are starting out or going in, and in the morning and evening business and home travel, or in cases of "bunching." The difficulties in overhead construction and insulation are increased, but it is said that only one-fourth to one-half the overhead copper is required as for a two wire all copper system, such as the double trolley.

A common practice is to bury at certain points on the car line old car-wheels, rails, or other forms of plates to collect the ground currents connected by supplementary wires to the power stations. But instances are known where such supplementaries have been used of so great length and consequent resistance, that instead of carrying the current back to the dynamos, they were found by test to be actually positive to the earth. Their insufficiency is more explicitly shown in the experiments[2] of Mr. J. D. Rastron, Chief Engineer Union Railway Company, Chester, Pa., whose tests showed in one instance that the track and ground supplementary wires were carrying 235.5 amperes of current, the city water mains 12.8 amperes, and the plates, though connected with an unquestionably thorough ground in a creek, but 0.5 ampere. This was doubtless a case with exceptionally unfavorable conditions; but even under propitious circumstances, no great proportion of the current could be expected to reach the isolated ground plates, of relatively small earth contact, as compared with the quantity following the long and heavy lines of pipe so widely to be encountered by earth currents.

Recognizing that the currents must follow the main pipes to some extent under existing conditions of railway practice, and that the injurious effects are produced at their points of leaving, the Water Department in Cambridge, Mass., has had heavy copper wires attached to the water mains and carried to the negative generator terminals of the electric roads, that the currents collected by the mains might leave them by a metallic circuit. The water pipes were also connected to the rails, and the water and gas services wired together within the cellars along the route of the road; intentional use thus being made of the pipes as conductors. In Milwaukee, the railway company connected their rails to the fire hydrants, but provided no means for the departure of the current until prevailed upon to supply an attachment near the power station. Elsewhere it has been proposed to run

1. Journal Assn. Engnr. Soc., Feb. '93, p. 55.
2. Street Railway Journal, Dec. '93, p. 810.

feeders to the power houses from the mains in various sections of the city, but not to connect the mains directly to the rails; in other words, to employ the mains, but only as a huge system of collecting ground-plates.

Of the three grades of this arrangement, the last is preferable, but even that is by no means desirable, for it serves to increase the conductive power of the pipes and so invites the approach of currents; and while no especial harm might be done to a perfectly tight water main so wired, a pipe having leaks or loose joints, or a gas main with cemented bells, would be speedily affected injuriously. Nor should the suggested attachment to water mains alone be permitted without protest by gas companies, for if the water mains be made better conductors than before, more tendency will be manifested by such vagrant currents as may have reached the gas pipes to leave them and enter the water mains, so spreading the likelihood and locality of electrolyzation.

Mr. I. H. Farnham, in a recent paper before the Institute of Electrical Engineers, gives the following description of still another plan:

"Prof. Elihu Thomson suggested placing motor-generators along the railway line wherever the cables and pipes are found to be in danger, to be operated by the railway power current; the secondary current developed by these generators to be utilized to lower the potential in the cables and pipes to zero with respect to the surrounding earth or rails. The suggestion included means for automatically starting and stopping the generators, as cables might become positive or negative to the rails. The motor-generators would, so to speak, pump the current out of the cables and force it into the rails whenever the potential of the former should rise above zero. This plan has not yet been put into operation so far as I am aware."

Among the devices described in the foregoing paragraphs are most of those which have been adopted to any extent by the railways as preventives of electrolytic action. As deterrents or diminishers, many of them assist, but not one fulfills the requirement of complete protection, nor can any system do so which uses the rails to any appreciable degree as conductors. On many of the lines of electric railways—perhaps on most of those within the cities—the rails lie parallel for long distances with lines of gas and water mains, much better conductors than equal columns of earth, and in cases of poor bonding often exceeding in conductivity even the rails themselves. Separated from the latter only by a strip of earth, more or less moist, the *capacity* of the rails to conduct all the current is subject to the conductive law of inverse resistances, for so long as the rails offer any resistance at all, some current will also follow the lines of higher resistance. The pipes will be called upon to bear a portion of the current under the most favorable circumstances, and so doing, will be injured, for it has been shown by experiment under conditions identical with those existing in practice, that electrolytic action may occur with differences of potential of 0.5 volt.

It has been claimed that the perfection of the alternating current motor in its application to street railway work, would solve the problem of electrolysis; and the advantages of this system for long distance power transmission have caused it to be considered for adoption on the Erie Canal trolley line. But though faith in the inability of alternating currents to exert electrolytic effects is not universal, we need not consider the pros and cons, for the motor in satisfactory form is not yet on the market, and the immediate solution of the question before us must be sought apart from its improvement.

A system which many large roads are now adopting as a means of decreasing their current leakage is that of using insulated track feeders designed to carry the entire current, joined to the rails at short intervals, each 400 or 500 feet, for instance. The rails are thus employed as conductors only between the feeder junctions, and the liability of leaking currents is very much reduced. The system is certainly a step in advance of anything we have yet considered; and having been adopted in Boston, Brooklyn, Cleveland, etc., we should soon hear if by its use destruction of the pipes is wholly avoided.

A series of well planned and exhaustive tests of storage batteries, conducted upon a specially equipped road in Washington, showed that no successful accumulator had yet appeared for railway work. Other suggestions have been considered, and as the insulation of the rails themselves may be at once dismissed as impracticable, the absolute and complete prevention of electrolytic corrosion thus narrows to the use of such a system as shall convey the current without the use of the rails or earth for any portion of the distance. Of this character are the double trolley lines, of overhead construction, like those in Cincinnati, etc., or underground, like the conduit systems in Washington and Chicago. Either plan offers full and complete immunity from electrolysis, at a cost for copper no greater than that of a single trolley system with all-copper return. The double overhead design was one of the earliest forms employed, but was generally abandoned for the simpler single trolley on account of the difficulties of construction and insulation. That it is not impracticable is evidenced by its extensive employment in Cincinnati; and were the value of the destroyed pipes added to the costs of single-trolley operation, very little argument might be needed to convince railway managers of the superior advantages of the isolated metallic return.

As to the double underground trolley, or conduit system, invention has been rife in its direction, and many designs are offered, though but few have received practical test. The Love conduit system at Washington and Chicago appears to be operating satisfactorily, and doubtless a number of others of the plans proposed also possess the elements of success. With the saving of ten to twenty-five per cent. in the cost for current—which we are assured would follow the introduction of an all-copper circuit—the probable deterioration of overhead work, relief from the liability for damages to pipes, and the fact that the trolley lines cannot long escape attention in the clamor for putting the wires underground, the prospects for the extension of conduit installations seem favorable.

Another class of injuries from the same general source as the electrolytic has been brought to the attention of your committee, namely, arc effects caused by short interruptions in the continuity of the metallic lines made to serve as conductors. Of this character were the cases in Boston, where the yarn was ignited in the bells of pipes which were being laid, and in Indianapolis, where the leaking current followed down a trolley pole and burned a hole in the natural-gas main close by, the escaping gas from which returned through the hollow pole and was lit at its top, destroying a considerable extent of the neighboring overhead wires. There the railway's system was the greater sufferer; but such poetic justice as this seldom follows. The solution of the electrolytic question, however, will largely carry with it the prevention of this class of effects, so that they need not be specially considered.

In detailing the several plans which have been tried or suggested for the abatement of the troubles which we are considering, your committee have endeavored to show warrant for their belief that the full remedy for the difficulty cannot be applied by those who are suffering from its effects, but *is* attainable by the railway companies, and must of necessity rest with them. That they will endeavor, if assuming the cost of the work, to adopt the cheapest method which offers a measure of protection to the pipes, is of course to be expected. But their responsibility and liability once fixed, we may insist upon their adoption of an absolute preventive, or their rendering of adequate indemnity for all electrolytic injuries to our systems.

The regulations adopted by the special joint committee of the two English houses of parliament, to be applied to electric traction companies installing their systems under the jurisdiction of the board of trade, are much more stringent than any which have been proposed in this country. Our object is to secure the proper protection from injury by systems already in operation, of a quasi-public nature and occupying the streets like ourselves, whose extension we would not seek to hinder or whose methods to question except as they entail danger or expense upon us in our exercise of rights and duties equally important with theirs, and materially antedating them in introduction.

Mr. H. H. Humphreys, in his paper on this subject before the Electric Club of St. Louis, remarks:

"The courts have decided, in numerous telephone cases, that the street railways have a right to the use of the earth as well as other people; but the question whether they would allow the railroad companies to use the gas and water pipes, and by using them, use them up, has never been decided that I know of."

The supreme court of Tennessee has held,[1] however, in an issue on behalf of a telephone company whose operation was affected by induction at the advent of electric traction, that it was not the legal duty of the telephone company to protect itself, but that it devolved upon the railway company to refrain from causing injury.

In several places where the water supply is conducted by a department of the municipal corporation, the commissioners have notified the railway managers that their companies would be held accountable for damages to pipes, and that the supply of water to their power stations was liable to interruptions unless the source of danger was removed. With the realization of the actuality and extent of the danger, water companies and departments all over the country are taking steps toward obtaining an understanding with the railways causing the trouble; and especially in the cases of such cities as include water supply as a function of the municipality, the gas companies cannot do better than co-operate with them for mutual protection. If personal and corporate interviews and correspondence with the railway people fail of their object, the courts may be appealed to for restraining orders. Application for a stay of the injunction would doubtless be made on behalf of the railway, and the equity of the question would then be brought to a hearing. But meantime the deterioration of the pipes would be progressing, and even with the installation of a double trolley system decided upon by the railways, some time would elapse before it would be completed. Your committee would then recommend the insulation of all renewed pipes in

1. Street Ry. Gazette, Mch. 24, '94, p. 131; Street Ry. & Elec. News, Apr., '94, p. 44; Western Electrician, Mch. 31, '94, p. 162.

places found to be injured—the drain-tile casing being probably the best for services and small mains, and boxing filled with pitch for larger mains—and the use of cement joints in any new main being laid. The detection of leaks and the determination of unaccounted-for output are so much easier to gas than to water companies that any marked losses on the gas pipe lines at least are likely to be signalized in some manner readily recognized.

In justice to the railway companies it must be said that they are fully alive to the serious character of the problem which confronts them, and are equally anxious with ourselves to remedy and avert the trouble. They have a vital interest in the matter apart from the liability under which they rest for damages to other underground metallic systems, for the solution of the electrolytic question means to them a marked reduction in operating expenses, greater efficiency of the motors, and relief from the menace of interrupted water supply. But they naturally hesitate to accede immediately to demands which would involve the reconstruction of so considerable a portion of their plants; and as one of the electrical journals states, while the double trolley would remove all cause for complaint, the railway companies will exhaust every other means before going to the expense which that remedy would involve. But with recognition of the justice of claims for indemnity for injuries to our distributing lines, and a clear demonstration—such as is now being afforded in several directions—of the futility of any half-way measures, we think that the street railway world will eventually concede the superiority of the double trolley and its kindred systems.

Your committee then summarize their findings as follows:

First. Electrolysis from the grounded currents of electric roads is rapidly injuring gas and water pipes, and it is admitted by street railway people that the injury does proceed from their operations.

Second: Complete relief from its action *cannot* be reached by any device applicable by those injured, but *is* attainable by certain changes in the electric railways.

Third: The gas and water interest should unite in demands for remedial measures which shall secure the adoption of systems undoubtedly effective, and which will thereby avoid a revival of the question a few years hence.

Fourth: Pending the discussion or completion of the relieving systems, the pipes should be protected at exposed points, at which the policy of increasing the resistance by insulation should be followed rather than that of increasing the conductivity by wiring.

Respectfully submitted,

GEO. T. THOMPSON,
ALTEN S. MILLER,
JAS. SOMERVILLE,
Committee.

APPENDIX TO REPORT OF COMMITTEE ON ELECTROLYSIS.

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An asterisk [*] indicates a reference of especial interest. A dagger [†] signifies that the article referred to is illustrated. A list of the periodicals indexed, explaining the abbreviations of their titles, follows the references.

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Discussion.

Mr. Thompson—I have here a number of specimens of corroded pipes, gas services and water services, and one specimen of water main. Some of the specimens have their histories attached, and some are plainly apparent from their appearance. Here is one in which the moist earth was in contact with the pipe for a considerable distance, and the current left it apparently in a sort of sheet. Here is one where the greatest action took place at a union. Here is a specimen where the direction of the rails evidently did not follow the direction of the pipes beyond this elbow. The current left at the elbow and the pipe corroded at that point. The rest of the service is apparently free from corrosion. We have some samples here which have been in service not over one month. One, which was exhibited at Chicago, had been in only one month, and was one of four pieces which had been replaced in the same position within six months. That piece was encased in a drain tile, and when opened last month, after eleven months of service, was apparently free from any action, thus showing that drain tiles are wholly effective, but also showing that the current must have passed out at some other point.

The President—The report of the Committee which you have heard is very thorough, and is of extreme interest to all members of the Association. I trust the members will discuss the subject fully, and ask such questions as they desire. I feel like saying one thing—I had a letter from Mr. Miller the other day calling attention to the report of this Committee. You can all see that the Committee has done a large amount of work, and Mr. Miller wanted me to say to the Association that he had taken part in it to the extent of signing his name at the end of the report. He wanted the Association thoroughly to understand to whom the credit for this report is due.

Mr. Thompson—Here is a section of 6 inch water main which has a history. In the *Water and Gas Review* for April, and in the AMERICAN GAS LIGHT JOURNAL, of late issue, there was an account of the bursting of a 6 inch water main at St. Louis, which had called forth from the Water Commissioner, at St. Louis, a letter to the President of the Suburban Street Railway, notifying him that unless steps were taken to abate the difficulty the Railway Company was liable to have its water supply shut off. Here is a section sawn from the main, showing how the pipe was attacked on all sides. This piece is a section from a lamp riser from the corner of Fourth street and Washington avenue, St. Louis, where a trolley wire fell across a lamp post and an arc was formed between the wire and the riser, burning through the pipe. The gas escaped to a blind vault at a corner, and was there ignited, and, exploding, carried up some 30 square feet of granitoid pavement. This sample of lead pipe, and this of cast iron, are exhibited by the courtesy of Mr. Andrew J. O'Riley, the Lighting Inspector of St. Louis.

Mr. Dunbar—Does it affect lead pipe as much as iron?

Mr. Thompson—Just as much. With us they are affected equally.

Mr. Dunbar—On page 3 of this report Mr. Thompson gives one of the causes of electrolysis as being due to the electricity leaving the pipe at a cement joint and re-entering a little further on. Then, on page 11, he recommends cement joints in the laying of a new main. I would like to have him explain.

Mr. Thompson—I think the fourth recommendotion of the Committee makes that clear—as well as the paragraph following the first remedy, which was considered on behalf of the Water Company: "The adoption of insulation at the current's points of departure would increase the resistance of the mains and so decrease the proportion of current carried." The final recommendation is: "The policy of increasing the resistance by insulation should be followed rather than that of increasing the conductivity by wiring." We cannot prevent some of the current reaching our mains, but by increasing their resistance we can make the proportion of current to be carried as low as possible, and in my opinion it is in that direction that our only means of prevention lies.

Mr. Highlands—Did Mr. Thompson, in pursuing his investigations, try to measure the amount of current going through the main, and its voltage? If, in some of these services that are the most corroded, he knew what amount of current was being carried to the main in that vicinity, and how how he determined it.

Mr. Thompson—A number of determinations were made by Mr. O'Riley, who used in making them the Weston ammeter and voltmeter. In making connection between water mains he used a cap which screwed upon the water plug, with a binding post for attaching the wire, and then made his connections at the opposite end, by either connecting with the main or else by using a steel rod with a binding post at the top and attaching it by contact with the main above. A number of determinations have been made throughout the city of both the voltage and the amperage carried, and they vary very greatly; but our investigations upon the subject have brought to our notice very forcibly the fact that the voltage does not make much difference, and that a low voltage may in time occasion just as great electrolytic action as a higher voltage. The amperage has varied very greatly, differing according to the distance from the power house, the character of soil, the size of main, and a number of other factors. In one instance a test was made between a water main immediately in front of one of the power houses and a No. 000 copper wire specially run by the superintendent of the power station

to the negative bus bar in the station. In that instance 22 amperes of current were being carried. On the request of Mr. O'Riley, the superintendent at this station threw out his switch, counted 10, and then threw it back again. In that interval the needle on the ammeter was watched, and it fell immediately to zero, but immediately rose again when the switch was replaced, thus showing that the current was not electrostatic, but that it had come solely from that power house.

Mr. Highlands—What was the highest voltage you found there?

Mr. Thompson—I would not like to say. I have the readings first taken and some quite high voltages were found. As much as 80 volts have been found in some instances, but those are rare. Still a low voltage is just as effective in destructive action as the higher.

Mr. Highlands—I made a few investigations on that line myself, and may as well admit that the further I have gone in the matter the more I have been nonplussed. A year ago, in repairing a water main, probably a mile from the station, I found a leak in the main due not to electric action (and I will preface that by stating that the street railroad there grounded their rails to the hydrant branches), and in taking the pipe apart, on breaking out the last piece an arc was formed from one pipe to the other, that was probably 6 inches long. Of course the voltage necessary to make an arc of that kind would be so enormous that it was entirely out of the question for it to have jumped across, so the arc itself was probably formed by following the iron as it dropped out, rather than by jumping across after it fell out. The voltage was high enough to shock the workmen. I then examined to see if there were any currents running from the water pipe to the gas pipe, or *vice versa*. That was first brought to my attention by the underwriters, who objected to the use of motors in buildings operated from street railroad powers. I connected the gas and water services together in a great many buildings, but have never been able to detect any difference in potential between those service pipes; and on running the wire across the galvanometer would never show any current. The difference between those two actions was so extreme a mile away from the station that there was an arc crossing on a broken water main and upon connecting the service pipes together, and failing to find any electricity by any test at all, was so diametrically opposite that I was staggered in the matter, and have been staggered ever since. I furnish power now to the street railroad companies from the power house of the gas works plant; and we have wired with a return wire from the dynamo to the rails, and to a 10-inch water main that parallels their tracks near the entire length, and also to a deep well, and I have never yet discovered any damage to the pipes in any place from electric action; but at the same time by the large spark which I discovered two years ago I know that the element of destruction is there if the current has not found an easier way of going back. As the result of my experiments and investigations I must say that I know less about it than I did before.

Mr. Thompson—What sort of bonds do you use?

Mr. Highlands—The bonds are No. 0 wire. The bonds are of no use at all.

Mr. Gwynn—How many cars do you operate?

Mr. Highlands—Twelve.

Mr. Gwinn—Is there much travel over the road?

Mr. Highlands—We use from 100 to 350 amperes.

Mr. Gwynn—It is claimed by Mr. Vail, in his paper read before the National Electric Light Association in Washington last February, and also by some other gentlemen there, that the rate of travel has a great deal to do with the matter; that the most trouble would be found where there was heavy traffic and where the cars would be blocked, and that in the smaller cities and towns, and where there were few cars, they would have but little trouble. I would like to ask Mr. Highlands whether he agrees with that statement.

Mr. Highlands—I would fully agree with that theory if it had not been for the effects I have found upon the water mains.

Mr. W. L. Brown—I would like to ask Mr. Thompson a question which admits of a practical answer—what would he do in circumstances like ours, where we have an electric road running probably three quarters of a mile along where we have a main, yet we find our unaccounted-for gas is not increasing. There are no reports of leaks, and the streets are paved the whole distance. How would he go to work to find out where the trouble was? If the destruction is going on there it may be going on all this time at a slow rate, and at some time may suddenly come upon us; but we don't want to wait, and we don't want to tear up an improved street. What would he do in such a case?

Mr. Thompson—Is there any method by which you can isolate a length of main along that paved street, with its cross connections, so as to determine what the leakage per mile of main really is in that distance?

Mr. Brown—Not without cutting the connections, which could be done, of course, but we don't want to go to that expense if it is not necessary. We don't know whether we are getting any injury there or not.

Mr. Thompson—The determination of voltage, and especially of amperage, along a line of main and services wherever they enter houses could be accomplished without any especial excavation; and that would determine quite surely whether there was any action taking place. You could take a service within a cellar and connect to the rails immediately opposite.

Mr. Harbison—In listening to the report of that Committee, and to the gentlemen who have spoken on this subject, not only at this but at other meetings, I have noticed that the principal attention has been given to the injuries that may or may not be done to gas and water pipes. We are just about introducing the trolley system and its blessings in our city of Hartford, and the thought occurred to me whether there is sufficient current on the gas and water pipes to affect human life. What would be the effect upon our workmen who go there to make such repairs as may be needed? If there is electric current sufficient to eat up cast iron mains and heavy wrought iron pipe, in a very few weeks or months, of which the Committee has just shown us samples, what is to become of our men who go into the ditch to repair that work, and have to put their hands to it? Have the Committee given that subject any attention, and is there danger to be apprehended? I would like information on that point.

Mr. Odiorne—We have a main directly under the street rail, and the pipe is very badly eaten, and our men at work on the pipes would be shocked somewhat, but not to any great extent. There seems to be no danger whatever to life. A man would get a shock in his arm, but it would not amount to anything.

The President—Suppose in disconnecting those pipes a person has his hand on each side, what would be the effect then?

Mr. Odiorne—He would get a shock, but it would not amount to anything. And there is a difference in men. Some men get shocks which affect them very badly, while others do not notice it at all.

Mr. Harbison—It might be important to inquire what would be the possible effect of this upon the labor element in the future. We all have to have gangs of men engaged in putting in services, making connections, and in repairing broken mains; and if the pipes are so near to a track through which a strong current is passing, and the shock received injures some men and may kill others, what will be the effect upon the labor element all over the country?

The President—Can Mr. Chollar give us any information on that subject?

Mr. Chollar—We have found, in our experience in operating the Pintsch gas, as the Committee has reported, that the amperage had much more to do with it than the voltage; that with a large current, when it leaves the pipe, and is positive to the ground, the pipe is rapidly eaten away. There are some samples here where the pipe has been in the ground or even lying on top of the ground only one week, and yet the pipe is much eaten away. It would seem to me, as it seems to the Committee, that with the overhead trolley and the earth current return, it is utterly impossible to provide against the corrosion of the pipes, and the natural conclusion is that the earth must not be used at all for the return current. We have found it so on the pipes where they are laid on top of the ground, that the current has been so strong that in disconnecting the pipes a spark would arc across and ignite the gas, and that the current had been taken up from the rails and switches, and had accumulated around the pipe to such an extent that the men who were repairing leaks in the Pintsch gas pipe had to wear rubber gloves. Even in touching the pipes with tongs and making a connection across those rails sparks would cross which would light the gas.

The President—Would you consider that dangerous to life?

Mr. Chollar—Not particularly; for I do not think it possible, with the pipe laying in connection with the ground there could be any electrical voltage in that immediate vicinity which would be strong enough to be dangerous, but still it is very disagreeable, and likewise expensive. As I told Mr. Thompson with regard to our report, it is possible to concentrate it in two words—"double trolley."

Mr. Butterworth—I think you all agree with me that the report of the Committee on Electrolysis is not only very complete and valuable, but that it emphasizes the importance of the question to gas companies by calling attention to the dangers they are exposed to and their helplessness in the matter. I think the consideration of the report of the Committee should not terminate without our placing ourselves on record in a very positive and emphatic way concerning this matter of electrolysis. I would, therefore, like to offer the following resolutions:

Whereas, Investigation has shown that the use of an earth return in

electric street railway systems necessarily causes a gradual but sure destruction of street mains and service pipes; and,

Whereas, The owners of these buried metallic systems are unable of themselves to prevent this destructive action; therefore, be it

Resolved, That it is the sense of this Association that the electric street railway companies can and should promptly adopt such measures as shall insure to all other interests immunity from the injurious electrolytic effects of their operation, and that, failing to do so, they should be held liable for all damages and loss resulting from said operation; and be it further

Resolved, That the gas companies represented in the membership of this Association should unite with the water and other interests affected with them in securing from the electric street railways prompt attention and action in the directions indicated in the report of the Committee on Electrolysis; and

Resolved, That the Secretary have printed 500 copies of the report of said Committee and the discussions thereon, together with these resolutions, for distribution among the members of this Association.

I move the adoption of the resolutions.

The President—It is moved and seconded that the resolutions as offered be adopted. Are you ready for the question?

Mr. Harbison—I would suggest as an amendment that the Secretary send to each member a certain number of copies for their use.

The President—I would imagine that would be the result of the adoption of the resolution; that the 500 copies would be divided among the membership.

Mr. Somerville—I would suggest also that the members give a copy of that report and resolution to the street car companies in their respective cities.

The President—That is a suggestion for the Secretary and the members to act upon. (The resolutions were adopted.)

Mr. Copley—In reference to the case at Aurora, Ills., the information which I furnished to Mr. Miller at that time was not as satisfactory nor as certain as that I am now able to give. Since the time I furnished Mr. Miller with this information the city has caused a sewer to be built in the business center of the town, where we have a main on each side of the street for some six or seven blocks. We had no trouble with unaccounted-for gas—that is, our percentage had not increased; and what pipes we had dug up did not show the effect of electrolytic action. I therefore concluded, as I told him, that we had not been damaged; but the digging of the sewer through the center of the street underneath the car tracks in almost every instance opened up to us all the service pipes we had crossing the streeet, and I can now tell you that I was mistaken in the information I gave at that time. In other words, our service pipes were very badly damaged in some instances, and in others they were not so badly damaged.

Mr. Thompson—That is what I rather anticipated in the reference to it in this report.

Mr. Copley—I gave that information to Mr. Miller last fall, or early in the winter.

Mr. E. C. Brown—In the report of his Committee Mr. Thompson refers to the Chester (Pa.) Company. It is either that Company or the Company at Carlisle which has brought this question to the attention of the courts. I understand that argument was to have been had on the 2d of May, but the Judge postponed it, as he desired to read up on this question of electrolysis, and I believe that on the 25th of this month he will render his decision as to whether or not he will grant a permanent injunction.

Mr. Russell—I would ask Mr. Thompson if the Committee took into account the nature of the soil in which these results were obtained.

Mr. Thompson—You will find in the report of the Committee a reference to the nature of the soil, and the statement that certain circumstances increase the liability to electrolysis. The samples here presented when prepared for boxing still held good yellow clay upon them, showing that the soil itself was not responsible at any rate for the samples in question. The character of the soil does undoubtedly affect the corrosion to increase it; but moisture is the principal factor.

Mr. Russell—I would like to ask Mr. Thompson whether any of the reports that he received were from seacoast towns, or from low-lying places where the soil was continually moist.

Mr. Thompson—You will find in this appendix a reference to the various reports of electrolytic injuries. Those from Boston, and from some other of the seaport towns, do give special emphasis to the fact that some of the corrosion might have been induced, or at least aided, by the presence of salt water; but so many of them are from inland that salty moisture cannot be depended upon as accounting for the great deterioration shown in the pipes.

Mr. Odiorne—I would like to ask Mr. Thompson whether the samples which he has on exhibition come from pipes which were laid in lead, or in cement joints.

Mr. Thompson—The main pipe was a water pipe laid in lead joints.

Mr. Darrah—Was that service pipe of steel or iron?

Mr. Thompson—It is an iron pipe

Mr. Butterworth—I move that the Committee on Electrolysis be discharged, with the hearty thanks of the Association for their services.

Mr. Harper—Before you put that motion I would like to ask whether the Committee have an opinion definite enough to be of benefit to the Association as to the danger from fire—where men go to repair a leaky pipe, which has been corroded by the action of the electric current. Whether there is danger of ignition when the men are at work upon it.

Mr. Thompson—The ordinary leakage from electric corrosion takes place within the earth. In the case of any lines of services where the earth might have shrunk away a trifle, by reason of being laid in made ground, and so permit the escape of gas into the cellars or into an area, there would be that danger. The electrical committee of the Underwriters' International Electrical Association laid special stress upon the danger from electrolysis, but not with reference to fires from gas pipes so much as the weakening and possible failure in water pipes in sections where additional pressure might be put upon them during a fire. You will find their report referred to in the appendix.

Mr. John Young—Is there any danger, in a main charged with gas, in drilling to put in a service pipe, with the gas turned on? I mean, in a main charged with electricity, is there any danger of a spark setting fire to the gas?

Mr. Thompson—There is that danger.

Mr. John Young—We found that out.

Mr. Harbison—That increases the difficulty with the workmen that I referred to.

Mr. Copley—I would like, in the nature of an amendment to the motion made by Mr. Butterworth, to express more than the usual appreciation entertained by this Association towards this Committee on Electrolysis, for the possibly very great value which this report may have to everyone of us interested in the gas or water business. I offer that as an amendment.

Mr. Butterworth—I accept that amendment.

Mr. Somerville—I agree to the motion if it is distinctly understood that Mr. Thompson is the Committee. (Applause.) A few letters and suggestions comprise all that I had to do with the report; so that Mr. Thompson deserves all the credit for his good report.

Mr. Thompson—I do not think that exception should stand.

The President—Are you ready for the question. Those in favor will say, "Aye;" contrary, "No." It is so ordered. Mr. Thompson, you have the thanks of the Association.

Mr. Thompson—On behalf of the Committee I thank you for your appreciation of its work.

The President—We will now listen to the paper, by Mr. S. M. Highlands, of Clinton, Iowa, entitled

THREE YEARS IN A COUNTRY GAS WORKS.

I do not think it is possible for me to add anything new to the gas industry, but I have long entertained the idea that the business was hedged around with too much mystery, and that the very conservatism that has been allowed to grow around it was one of the greatest drawbacks with which it had to contend. In the smaller cities the gas superintendent is alone, and in many places very lonely; and he is very apt to think his business a mysterious one; that he is the only man in the community who can master its intricate details; that all he has to do is just to wait until people come to their senses about the electric light craze, and everything will be serene.

It occurred to me some years ago that this was all a mistake; that educating the general public against their convictions is a slow and unprofitable proceeding; and that gas is only a commodity that people can either use, or dispense with without very much inconvenience. And, further, that the same methods that are most successful in other lines of business could be used to push the sales of gas, and with equal success. I fully believe that the unparalleled growth of the electric business was because of the efforts to make it popular without regard to any immediate profits.

Infused with these ideas, I assumed the management of the Clinton (Ia.) gas works on April 1, 1891. The works were the usual 6 inch coal gas works and were built in 1871. In 1875 they sold 5,500,000 feet of gas. In 1884 it had increased to 6,122,000 feet. In 1886 the Thomson-Houston Company built an electric light plant and the sales of gas

dropped to 5,892,000 feet, and in 1890 it had risen again to 6,491,000 feet, with the price of gas ranging from $2 to $2.50 per 1,000.

On April 1, 1891, the price was reduced to $1.75 for illuminating and $1.25 for fuel; and a contract was made for a set of water gas apparatus. At the outset of the new management, the old adage, "The money was made or lost in the retort house," was totally disregarded. The only aim was to make the kind of gas the public would use the most of, without much thought as to whether the gas was 16 or 24 candles, or whether it took 4 or 5½ gallons of oil, or 35 or 50 pounds of coal to the 1,000 feet. We believed then, as we believe now, that the principal duties of a gas manager were to sell gas, and that the making of it was a minor incident connected with the business; that the margin between the cost in the holder and the usual selling price was so great (greater by far than in any other large, legitimate business) that a manager could easily afford to have the cost increased by 10 to 15 per cent., if by so doing he could devote more of his time to selling it and thereby increase his sales. I will venture the assertion that there is not one manager here who believes he is selling one-half the gas the community would take and pay for, if he could only make it to their interest to do so.

In carrying out this idea, we advertised that for a year we would run free service pipes; sell gas stoves at cost; pipe buildings free; and in a great many places we furnished gas fixtures free. At this time the Company had only 235 meters set and not a gas stove in use. By May 1st orders began pouring in on us until we had from 15 to 25 gasfitters at work, and during the summer sold 185 stoves and set 392 meters for illuminating purposes. This work cost the Company about $4,000, and you can judge for yourselves whether it is worth this sum to add 577 new customers to a plant that only had 235 to begin with. By September 1st we felt strong enough to tackle the electric light company, and thought a fight with them would advertise us if nothing else. We sent a canvasser to all their customers and offered to furnish them with gas for a year for half the price they were paying for electric light, generally allowing the customer to say how many gas jets he would need to properly light his place. They had 53 customers, and we took 45 of them on this proposition and had them tied up for one year. This action on our part forced them to sell out to us at once at our price, and we failed to have any fun out of the scheme at all. We metered the 45 contract customers just as carefully as we did the regular ones and took the statements monthly. It might be as well to state here that these contracts raised a new question in our minds that we will take up some time and settle to our own satisfaction at least.

Please remember that all this occurred in a small town, where the manager could be personally acquainted with each of his customers and know what they were doing; and this article is supposed to be of no benefit to the larger cities. Those 45 contract customers were put on without any idea of making very much money out of them, but rather to force a fight on the electric company. We knew when we took them that some of them would get pretty cheap gas, and we were not disappointed. During the year for which they run, they used 2,894,000 feet, for which they paid $2,171.06, or 75 cents per 1,000. In December they used 600,000 feet; and in July, 122,200; one of the largest customers fairly heating his building with it, and paying only 40 cents per 1,000, while some of them were paying as high as $1.50 per 1,000.

We bought the electric light plant in December, 1891, and immediately reduced the price of electric lights 25 per cent., making the rate for arc light of 2,000 candle power $6 per month, for 9 o'clock lights, and $8, for 10 o'clock lights, the gas contract customers having the option of surrendering their gas contracts and taking the electric light at the new price; but none of them availed themselves of the privilege. At the end of the year none of the contracts were renewed. About one-half of them are now using gas and the rest have returned to the electric light.

We found a great many customers who thought they could afford to use a gas stove, but were afraid to try gas for illuminating purposes; and for such customers we always put a gas burner over or near the stove and connect it with the stove meter. The result was that in a short time the man of the house would come to the office and say that he was tired of sitting in the kitchen to read, and wanted one light in his sitting room; and this was soon followed by several more in other parts of the house at the regular illuminating rate.

Our office is kept open from 7 A.M. to 9 P.M., and all complaints are taken care of within an hour of their being made. A meter prover is kept in the back of the office; and when a customer thinks his meter is wrong we ask him to wait and see it brought in and tested. We are always willing to settle with him on the basis shown by the prover. I have yet to find the customer who was not perfectly satisfied after seeing this test made, and agreed with us that if there was anything wrong with his bill, the fault was at his house and not in our office.

Another imperative rule is, that while we now have a monopoly of the lighting business, our customers should not find out that we know it; they should always be treated as courteously as they are in any other mercantile house; a trivial complaint should be treated with as much consideration as the most serious one. Another rule that will have more weight with them than all others is, whatever we do must be well done. Nothing temporary allowed and never a makeshift.

In rebuilding the gas works, money was not spared to make it a good one. In rebuilding the electric light plant, the very best Corliss engines and high grade boilers were used. The results are that "no gas" complaints are rarely, if ever, heard, and we have not had a claim for rebate on account of "electric light out" for over two years. Our electric service has been so good that the city has just closed a contract with us for all their street lights for a period of 12 years, and the electric street railroad has contracted with us for its power for 7 years.

There have been no changes in prices on the gas for 3 years; and for the past 2 years we have been charging a fair price for all service work, also for all electric wiring and renewals. In the meantime, the growth of the gas business has been much more rapid than that of the electric business.

As I stated before, the Company sold 6,491,000 feet of gas to 235 customers in the year 1890. In 1891, they sold 11,432,000 feet to 627 illuminating and 185 fuel customers. At this time—January 1, 1892—we had 50 commercial arc lights and 800 incandescent ones. For the year ending January 1, 1893, we sold 18,000,000 feet of gas (an increase of 64 per cent.) to 940 customers, and in the year ending January 1, 1894, our sales of gas had increased to over 20,000,000 feet to 977 customers; while the electric lights had only increased to 65 arcs and 1,200 incandescents, exclusive of the street lighting. With the street lighting and street railroad work, the gross business of the electric light plant is larger than the gas business, but is, of course, a great deal more expensive to us to furnish. On the whole, we are satisfied that proper business methods will push the sale of gas just as readily as that of any other commodity, and that without it, the gas business is apt to cut a very small figure in small cities.

As some of you probably know, we also supply gas to Lyons, a city of some 7,000 inhabitants, immediately adjoining Clinton. Lyons has a municipal electric light plant that also supplies domestic lights. This plant has been established some 10 years, while the gas mains were only run 3 years ago. At the time we extended the gas mains there, nearly all the stores and shops were using the electric light. We did not make any effort to displace the electric light, but instead, concluded we would see what a fair competition between gas at $1.75 per thousand and arc lights at $5.50 each per month would result in. For the first year or so, we did not do a great deal of business with the stores. A customer would use the gas through the summer and then put back the electric lights in the winter when the evenings were long. In the summer of 1893, we sent 50 Welsbach burners up there to see what they would do. We equipped one large jewelry store with them at our expense and then waited for results. And they have been surprising, indeed; for to day there is not one store in the city using electric lights, the Welsbach burners having entirely displaced them; but at the same time it has cut down our sales of gas, and I do not know but that we had better let a few of the electric lights come back, if we can only get rid of the Welsbach burners. The burners are all that is claimed for them, and give our customers unqualified satisfaction; but the confounded things won't let any gas through them. The same jewelry store that was formerly using two arc lights, only used 3,000 feet of gas in December. After our experiment with them at Lyons, we would prefer furnishing electric lights, rather than Welsbach burners, in Clinton.

Discussion.

The President—You have listened to the reading of a very interesting paper, and one which has brought out some new ideas, in competition with electric lighting especially. Mr. Highlands is ready to answer any questions any of you may wish to ask.

Mr. Dunbar—I want to ask, What did those customers who are paying full price for gas think when you furnished some people gas at 40 cents per 1,000? How did they take it?

Mr. Highlands—In answer, I will say they must all have been very busy, for none of them said a word to me about it. I never heard of any complaint. I conducted our business just as they conducted theirs—without regard to what individuals were doing in the matter.

Mr. Copley—I would like to ask Mr. Highlands, with due deference to his cleverness in handling it, what he would have done had his con-

sumers been equally clever, and insisted on arranging with the electric light company for prices, and with him for gas at half that figure?

Mr. Highlands—I have discovered that it is much easier to ask questions than to answer them. I will simply state when I went into the business of contracting with electric light company's customers we did not expect at that time to buy their plant, nor was it done with the intention of forcing them out of the business; but I have frequently noticed, as probably most of you have, that a fight between two dry goods stores on opposite sides of the street will increase the business of both of them, and I did not know but it might do it with us. I wanted to fight with them anyhow, and to see what would be the result when we got through. In making those contracts I had a good canvasser, to whom I gave a list of the parties I wanted him to contract with, leaving it to his discretion as to the price he would make for those contracts—directing him to remember all the time that in what he did he was acting as the employee of the Gas Company. When we got all the contracts we cared for we simply stopped contracting. I believe several other parties asked us for similar contracts afterwards, but we refused to give them, saying that we had all we wanted of them. If it ever created any hard feeling in the community I have not discovered it—any more than it did when we advertised for six months that we would do gas piping free, at the end of which time we stopped it. A great many people since then asked us to do their piping free because we did it then. We shall probably take that question up again. I should not be surprised, when business opens up again, if we should attempt to see if we cannot get customers as I did before—but reserving the right to discontinue the practice at any time I saw fit.

Mr. Butterworth—I would like to warn Mr. Highlands and others who entertain the same views about putting in free service pipes and piping houses free, that before they do so they should thoroughly canvass the situation and ascertain whether or not natural gas is likely to come in in the course of a year or so, or an opposition gas company build up a competition; for in that case the property owners would proceed at once, and without any consideration for the kindness that the gas company had previously extended to them, to turn the natural gas or the gas of the opposition company into their service pipes and houses. We have had that done in our own experience.

Mr. Cantine—I am not a member of this Association, but have the honor of being a member of the Ohio Association, and have taken the liberty of coming here with the idea that Mr. Highlands was going to read a very interesting paper—as he has done—and I suppose that he could make a very much more interesting paper. Mr. Highlands and I fought, bled and died in the gas business long before Clinton was thought of. Let me tell you a little story. He came with us in 1873. The times were then, if anything, a little bit worse than they are in 1894. Your humble servant did the stoking in the day time and Mr. Highlands did it in the night. He was a little younger then than I, and as he could get along with a little less sleep than I could, he used to take his kit of tools out on the street and do pipe work. He and I together ran the business. Then we got $3 per 1,000 for what gas we did sell. Sometimes one retort made pretty nearly enough. Nearly everybody failed in the town and I suppose that was our only salvation. Had the merchants and business men remained sound we would have failed. Mr. Highlands probably remembers a great deal better about those times than I do, and I came here expecting to be greatly amused by his recital of the good times we had then.

Mr. Douglas—If Mr. Highlands thinks he can save 15 pounds of coal and 1½ gallons of oil by giving the works his personal attention, I think it would pay him to hire another man and then give the works his attention, because he could save a good salary every year in 20 million feet.

Mr. Highlands—In reference to that let me say that I do not now, and never did, take the credit to myself of being a close or economical manager. I said I did not give much thought as to whether it took 4 or 5½ gallons of oil or 35 or 50 pounds of coal to 1,000 feet, yet I think that most of the gentlemen present will concede there is probably somebody up there at the station who did look after those matters, and that there was not any more coal put into the cupola than was burned, and that there was not oil enough put into the gas to make it smoke very much, and we never have sold any tar.

Mr. Holmes—I am not a member of the Association, but thought perhaps the members might desire to hear a parallel case to that stated by Mr. Highlands—but with a different result. Some three or four years ago, I started on the other side, in Youngstown—I mean on the other side from what Mr. Highlands did. The Gas Company took a notion to have some fun with me and they went to contracting for gas at any price they could get; and I don't think they stopped at half way. We had something like 300 customers, and, of course, we had to save them or else get out of the business. But we took another tack. We went for the Gas Company. I think that within three or four days the electric light company had visited nearly every gas consumer in town and asked him for a proposition to furnish gas. They immediately went to the Gas Company to get its figures first. The Gas Company was pretty busy for several months taking care of its own customers, while we proceeded with our contracts for electric lighting. But those difficulties have all been settled down there now; we are all harmonious; and I am in the gas business to day. (Laughter.)

Mr. Highlands—All I have to say with reference to that is this—that our late competitor was the Thomson-Houston Company, a concern to which I know you gentlemen need no introduction whatever.

Mr. W. L. Brown—This paper emphasises one point which relates to the gas business as it does to every other business—that local conditions dominate what shall be done. Mr. Highlands knew what was being done in his town; he studied the situation carefully and worked to success. Those same plans might not do in another town, so it behooves everyone in looking upon his own ground to carefully study the entire situation, and then follow out the best line he can work on.

Mr. Somerville—Will Mr. Highlands state the population of that town?

Mr. Highlands—We have now in Clinton a population of about 18,000, and in Lyons perhaps 7,000 or 8,000.

Mr. Somerville—The number of consumers was very small when you went there for a population of that size. Nevertheless I wish to congratulate Mr. Highlands upon his paper. It is an excellent one, and shows that he has done excellent work. If these results can be obtained in Clinton, why can they not be obtained anywhere else? I presume the people in Clinton wear the same hats, eat the same food and are just as fond of the dollar as they are anywhere else. If that is so, why cannot this same kind of work be done in other cities and with equally good results? I believe it can be done if the work is carried on in the same line which he has adopted, and which is nothing but work, work, action. That is all about it. You all know very well that for years I have advocated that gas companies should do the gas fitting and have the control of it in their own hands. Here is the result of that course. The purpose is not to make money out of the gas fitting, but to get consumers. I am glad to have heard Mr. Highlands' paper, and I look upon his example as one worthy to be followed.

The President—In behalf of the Association I thank you, Mr. Highlands, for your paper, and assure you that we appreciated it very much indeed.

[To be continued.]

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, May 10, 1894.

Electric Light in London—Stealing Gas—Manchester Noxious Vapors Abatement Association—Artificial Lighting and Ventilation.

Whatever the advantages obtained by introducing the electric light as a substitute for gas in the principal streets of the city of London may be, it can scarcely be claimed that economy is one of them; although, after the arguments that have been put forward by enthusiasts in favor of the electric light as against gas, one is not surprised at any assertion, however outrageous, absurd, and even unjust. Many of our electric friends appear to prefer something that will catch on with the public, to fair and temperate statements, which after all will last longer and spread the farther. According to an official report made before the Streets Committee, 479 arc lamps are now in use in the main thoroughfares, and their cost is a trifle short of £12,500 per annum. They replaced 1,315 gas lamps, which cost, inclusive of maintenance, about £4,650 for a similar period. The extra expenditure is nearly £8,000, but as the arc lamps exceed one third of the gas burners replaced, the public are supposed to presume that they are getting additional value in the shape of a better and more brilliant lighting effect, to say nothing of having the latest fashion, which is a craze that extends to many things other than personal attire. This additional expenditure was passed in a very casual way without debate; but one can imagine what a furor would be created by a proposal to increase the gas account three fold, with a view of getting a better lighting effect.

Mr. W. C. Boyle, of Salem, in the course of a paper read at the recent meeting of the Ohio Gas Light Association, treats of the public prejudice that exists against gas companies in a characteristically brilliant and vigorous style, and his eloquent remarks would be as pertinent if read in London as they evidently are in Salem. They suffer from

the same sentiment over here, and are frequently obliged to submit to unjust and even tyrannical regulations in deference to it. Especially when they have the misfortune to enter the law courts do they find themselves regarded as wealthy and too powerful corporations, who can afford to lose, and deserve to have their wings clipped. So much is this feeling in evidence that it has more than once been my duty to advise a gas undertaking to submit to an obvious injustice rather than seek the remedy that, while perfectly certain to private individuals, would be extremely dubious and erratic as applied to them. It matters not in what position they appear, whether as plaintiffs to recover just debts, as appellants against assessment valuations, or as defendants to actions for nuisance or damage, the light in which they are regarded by "the bench" is the same, and those who oppose them may always count on getting the benefit of the doubt. But although treated as unscrupulous parties, with no soul to be saved, or body to be kicked, the gas business is conducted in a fair, honorable and straightforward manner that will compare most favorably with the business practices of ordinary traders.

In no case is this prejudice more evident than when they claim that legal protection for their property, to which every inhabitant of a civilized country is entitled. If anything, our laws are a little too severe in respect to offences against property, especially as regards small thefts. Ignorant and poverty stricken people have been condemned to prison for stealing a loaf or a bunch of turnips. But the general practice in regard to thefts of gas is decidedly the other way. The culprit is let off with a small fine, and it is cheaper to steal a lot of gas than to visit your opponent in business or politics with "one for himself." In the little island of Jersey, which enjoys an independence of its own, gas appears to be regarded exactly as any other kind of property, for a person convicted of stealing gas there was sentenced to four months imprisonment, to be followed by five years banishment from the island. But our usual practice here was exemplified at a town in the Midlands a few days ago, where a defaulting consumer, who had followed up the non-payment of his debts by a similar offense, escaped with a fine of £1.

The crime of stealing gas is one that can be practiced with comparative safety. If discovered at all, it is only due to some fortuitous and accidental circumstance. Yet if the person who fraudulently uses the gas was to exercise his predatory abilities upon some other form of property to an equal value, he would have a hard fight to keep out of prison. Perhaps if he could afford to engage the very best legal advice, he might manage it, but it would only be by the skin of his teeth. Gas companies may well claim that their property is entitled to as much protection as other personal possessions, and think themselves unjustly treated and placed at a disadvantage when such is not accorded to them.

The city of Manchester rejoices in the possession of a "Noxious Vapors Abatement Association," and visitors to this busy trading center in the North will agree that there is plenty of scope for the labors of such a society. It has been approaching the Corporation Gas Committee with a request that the price of gas should be reduced from the present figure of 2s. 6d. per 1,000 cubic feet to 2s., and also that the present high charges for use of meters should be either reduced or abolished. By way of blunting the edge of the gibes that may be uttered by cynical outsiders, it will be well to explain at once that the gas supply of Manchester, though notoriously not so pure as it might be, is not one of the substances included in the objects of the Association as calling for abatement. Their attention is chiefly directed to the copious columns of smoke produced by the large quantities of coal consumed in their district, which outpour prejudices the public health and disfigures the public buildings and statues, and their object in seeking the reduction of the price of gas is the laudable one of encouraging its use for fuel purposes in the place of solid fuel, in order to reduce the smoke clouds with their attendant sulphur, dust and dirt. The memorialists have met with scant sympathy from the Gas Committee, and their request was simply refused, though it was insinuatingly pointed out that the action of the Committee only holds good for a year. Perhaps they were unfortunate in broaching the matter just now when the principal business before Gas Committees is that of paying the piper for the expensive tunes played by coal dealers during the latter half of 1893. The Secretary of the Association, in reporting his failure, writes: "It is pitiable to think that all the evils which result from excessively polluted air must be allowed to continue, in order that the present unfair incidence of rating may be maintained. Some of us probably save a few shillings a year which have to be paid by large gas consumers, but all alike suffer from the results of the smoke nuisance which drives people out of the city for residence, thus reducing ratable value and causing separation of classes." I see that the question of municipal control of gas works is exciting some attention in America. Those who are interested in this matter, and inclined to suppose that corporation ownership leads to a better, cheaper or purer gas supply than that furnished by private companies, would do well to follow the history of the Manchester gas works, which have been the corporation property from the commencement.

It is generally assumed by advocates of electric lighting that the combustion of gas in any ordinary room has the effect of rendering the air impure and unwholesome, and therefore a great advantage secured by substituting electric light for gas is that of a pure and wholesome atmosphere. Some have even gone so far as to claim that in this way the electric light may be a means of prolonging human life. But according to a report recently published, on the ventilating arrangements of the Houses of Parliament, it appears that these views must be reconsidered. The arrangements at this important building are of a most elaborate character. They include not only the removal of stale and admission of fresh air, but also the warming, cooling, or filtering from fog of the incoming air supply. So effectively is the latter condition fulfilled that the air is perfectly clear inside the house, even when a dense London fog is prevailing outside. Like most elaborate arrangements, however, this system is not perfect, and it has, therefore, been reported on by a recognized expert. The special point to which attention is now directed, as evidenced in this report, is the fact that if proper ventilation is to obtain in any inhabited room, the atmosphere must be changed so frequently that the presence or absence of gas, or the agent for lighting that is used, exercises no important effect whatever. Mr. Keith, the expert alluded to, thinks that the fresh air requirements of the House of Commons amount to something over 1,000 cubic feet of air per hour for each occupant in the winter, and at least three times that quantity in the summer. The matter may be put in another way. If the atmosphere of any inhabited apartment is allowed to remain without the changes induced by proper ventilation, it will become foul and unwholesome from other causes long before it is vitiated by the products of combustion from any reasonable quantity of gas used for artificial lighting. It follows, then, that the wholesomeness or otherwise of an atmosphere in an interior is not affected by the kind of artificial light used, so long as anything approaching to a proper degree of ventilation is maintained.

But the gas lights exercise a useful effect that the electric light admittedly cannot supply. They keep the air in circulation. Very soon after the introduction of the electric light, impartial observers became aware of the fact that the vaunted purer atmosphere did not obtain. In some cases it was found that rooms became worse instead of being better ventilated. In smoking rooms, especially, it was found that the smoke did not dissipate or disperse so rapidly, with the electric light, as it formerly did with gas. The reason of this is obvious. In an electrically lighted room the air is stagnant, but when the apartment is lighted by two or three gas lights in the center, a steady and regular current is maintained. If a smoking table is placed under a gasalier, and three or four smokers seat themselves thereat—a condition of things that not infrequently obtains at gas engineers' meetings—it will be observed that the smoke draws up briskly towards the gas lights and passes rapidly through the globes. If there is, as there ought to be in every inhabited room, a proper foul air outlet, it will be observed that the rush of hot air from the gas lights facilitates proper ventilation. As with tobacco smoke, so it is with odors from the kitchen and other things about a house. The fact of the matter is that apart from the question of artificial lighting, proper ventilating appliances must be provided if a pure air is to obtain; and if these are not in existence, the substitution of electricity for gas will not compensate for their absence.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

"THE gas war at Port Huron, Mich., is on, for the two Companies there evidently propose to make it warm for each other, but in a different way from which they make it warm for the public, by furnishing fuel gas in stoves. The new Company is offering gas for lighting, at $1 per 1,000 cubic feet, with 10 per cent. off for cash, and for fuel, at 50 cents per 1,000 cubic feet, with 10 per cent. off. Now, the old Company does not intend to be outdone, for it proposes to meet this schedule, having decided to do so at a meeting held about a fortnight ago. The contention will be severe on the shareholders of the Companies, especially on those of the new Company, since it will mean that their dividend prospect has faded into the dim and mighty distant future. The stockholders of the new Company reside outside the State of Michigan, while the stockholders of the old Company, a large majority of whom reside in Port Huron, will not feel it so hard, for their plant is entirely rebuilt, with the latest machinery, all of which has been paid for. Further, the Company now has on its ledgers a large number of consumers who have

been treated fairly in the past. This is fortunate, that while the people are getting the advantage of lower gas than that distributed in any other city in Michigan, the home stockholders will not be hit so hard by the competitive price as will the foreign stockholders. As a result of the splendid new plant under the control of the Port Huron Gas Light Company, the gas will not only be manufactured cheaper than formerly, but it will be richer and brighter, to the greater good fortune of the consumers. The gas will be made mainly from coal, enriched by oil and thoroughly purified by new machinery of the latest construction. It will not be experimental nor made out of water *enriched by wind*. On June 1st the reduction goes into effect, and the new gas will then be supplied.—*"

THE American Meter Company has been awarded the contract for furnishing to the Peoria (Ills.) Gas Light and Coke Company an 8 foot station meter. We might further add that since Mr. Chas. V. Newman has taken hold of the Peoria Company's fuel gas department over 50 ranges have been placed and orders for others are of daily occurrence.

AT the annual meeting of the Portland (Me.) Gas Light Company the following Directors were chosen: Edward H. Davies, William W. Thomas, William H. Moulton, Fred. N. Dow, Chas. S. Fobes and Zenas Thompson. The Directors subsequently organized by electing the following named officers: President, Edward H. Daveis; Treasurer, Samuel Rolfe. The following extracts are taken from President Daveis' annual report: "The consumption of gas for the year ending April 30, 1894, was 55,836,600 cubic feet, a gain of 3,284,600 over the preceding year. The net receipts from the sales of gas amount to $39,314, against $46,563 for the preceding year, owing to the reduction in price. The net receipts from the sales of coke and coal tar were $11,582, against $14,000 for the preceding year. This falling off was owing to the small quantity of coke on hand at the beginning of the year and to running the retorts in the old benches. The regenerative furnaces we had proposed to build would have produced 5 bushels more of coke for sale per ton of coal—but the old retorts held out better than expected, and on the whole it was more economical to use them another season; 5,760 tons of coal and 128 tons of oil were used in making 65,151,000 cubic feet of gas. We have 3,115 consumers, a gain of 50. Twenty-seven new service pipes have been put in; 667 feet of new street mains have been laid, and the 4 and 3-inch mains on Exchange street have been replaced by two 6-inch pipes, from Fore to Middle street; 119 gas stoves have been sold, an increase of 71 over the preceding year. The price of our gas was reduced a year since, with rebates to large consumers, making the net price from $1.25 to $1.50 per 1,000 cubic feet. This is a low price for a Company selling less than 56,000,000 feet a year, and making pure coal gas. The Boston and Bay State Gas Companies sell 40 times as much gas as we do, and they make water gas. * * * Leaving out those two Companies, whose large output places them beyond comparison, the report of the Massachusetts Gas Commissioners gives the average price of all the Massachusetts coal gas companies selling annually more than 30,000,000 feet, to be $1.49 per 1,000, against ours at about $1.42. Many of these Companies make water gas. The report does not state how many, as all are classed as coal gas companies except those making oil gas, the price of which averages $3.74 per 1,000. For the past six months our profits, with some interest added, have nearly covered the usual dividend. For the coming six months, with the smaller consumption and larger running expense, we shall have to draw largely from our insurance and renewal funds; and if no disaster occurs these funds may enable us to keep up our dividends until the increased consumption due to the low price shall give sufficient profits."

THE new rates for gas and electric lighting at Medina, N. Y., go into effect on the 1st inst. The gas rate will be $2 per 1,000 cubic feet, without regard to the quantity consumed. Incandescent electric lights for commercial uses will cost 5 cents per candle power per month, except for candle values in excess of 24, on which a special rate is allowed; but lights maintained in saloons will cost about 6 cents per candle power per month. For residence lighting, five 16-candle power lamps are to cost $35 per annum, each additional lamp to cost $5 per annum; and a supply of electricity by meter is to cost 1 cent per ampere hour.

ANN WHALEN sued the Citizens Gas Light Company, of Brooklyn, N. Y., in the local City Court, before Judge Osborne and a jury, to recover $2,500 on account of personal injuries sustained by falling on a pile of flagging stones which had been heaped up by defendant when making an excavation for some repairs to its pipes, at the corner of Sackett and Court streets. She claimed that the injuries sustained were permanent. The Company pleaded contributory negligence. The jury awarded her $2,000.

AT the annual meeting of the Kenton (Ohio) Gas and Electric Company the following officers were elected: President, Thomas Espy; Vice-President, Henry Price; Secretary, W. S. Robinson; Treasurer and General Manager, M. C. McVitty. A semi-annual dividend of 4 per cent. was declared, and a stock dividend of 10 per cent. was also determined upon.

THE Minneapolis (Minn.) Board of Trade recently considered the following resolutions:

Whereas, The subject of municipal lighting is a vital and important municipal issue, and is made of special interest to Minneapolis at this juncture by the City Council investigation;

Whereas, Minneapolis pays more for its gas light than many cities, and even more than some cities in which the cost of material is said to be less; and,

Whereas, The Minneapolis Gas Light Company is disposed to concede the city cheaper gas, and enter into a new contract regarding price; therefore,

Rezolved, That we commend the City Council investigation of the gas light question, and recommend a study of the question to Minneapolis citizens; and,

Resolved, That, in order to facilitate such an adjustment of the question as shall be just to the Gas Company and to the city, the Board of Trade hereby instructs its Committee on Municipal Lighting to submit to the Board the result of its investigations.

THE regular dividend of the Portland (Me.) Gas Light Company, of $2.50 per share, is payable on June 1st.

AT the annual meeting of the Phœnix Gas Light and Fuel Company, of West Chester, Pa., the reports of the President and Treasurer were of a nature up to warranting the declaration of a 3 per cent. dividend on the capital, payable on and after June 1st. The following Board of Directors was elected: L. B. Kaber, N. H. Benjamin, Harry Sloyer, John M. Reeves, I. J. Brower, H. H. Gilkyson and Alfred E. Eachus. The Directors elected the following officers: President, H. H. Gilkyson; Secretary, E. N. Pennypacker; Treasurer, I. J. Brower.

GROUND was broken a fortnight ago for the new plant of the Nanticoke (Pa.) Gas Company, which is to be located on the filled-in ground to the rear of the two planing mills near the Nanticoke station of the Pennsylvania Railroad Company. The work is under the direction of Supt. G. W. Beers, who will forward it with all possible dispatch. The main system so far mapped out provides for the placing of 5 miles of pipe.

AT a meeting of the Everett (Mass.) Common Council a communication was received from the Mayor vetoing the order recently passed by the Council authorizing the Mayor to petition the Board of Gas and Electric Light Commissioners for an order directing the local Company to reduces the charges exacted by it. The Council passed the order over the veto. In refusing his assent, the Mayor explained that his reason for so doing was that he had signed the contract for the public lighting at the figures submitted by the Company.

THE project for establishing a municipal electric lighting plant at Oshkosh, Wis., has been abandoned, and the city will receive bids for the public lighting from the two local Companies.

AT a recent session of the Philadelphia Common Council, Mr. Morrow presented the following, which, on motion of Mr. Van Osten, was referred to the Gas Committee:

Whereas, The price of gas has been reduced to $1 per 1,000 cubic feet in consequence of which it had been expected that the consumption would have been very largely increased through the introduction of gas stoves, gas engines and other appliances; and

Whereas, The consumption of gas has not increased, but, we are unofficially informed, on the contrary, there is danger of a deficit in the city accounts, owing to the falling off in the receipts from the Bureau of Gas, due to said reduction; therefore,

Resolved, By the Select and Common Councils of the City of Philadelphia, that the Director of the Department of Public Works be requested to transmit to these Councils as soon as possible such information he may have as to the use of gas appliances, for other than lighting purposes, in the city of Philadelphia, with such recommendations as would, in his judgment, lead to a more general introduction of gas

stoves, gas engines, etc., particularly with reference to the advisability of establishing a permanent corps of employees to make necessary connections, etc., free of cost.

THE Gas Company, of West Chester, Pa., has just completed a most successful exhibition of the merits of gas cooking purposes, said exhibition having been carried on during the afternoons of May 24, 25 and 26. The afternoon sessions lasted from 2 to 5, and a final session was held on the evening of the 26th, lasting from 7 to 9. Cooking was carried on in full view of the audience, and those in attendance evidenced their interest by the close attention which they gave to the proceedings. The room chosen for the exhibition was in a building in the heart of the shopping center, and everything was conducted in the smoothest possible manner. The rate for fuel gas in West Chester is $1 per 1,000 cubic feet, and at the main office a varied assortment of gas appliances is kept on show.

THE new plant at Hanover, Pa., is in successful operation, and the proprietors are satisfied that as a business venture the works will repay them for their expenditures. The cost of the improvements was defrayed by an issue of $8,000 of preferred stock, which the Company can cancel at any time by paying par therefor.

MR. JOS. W. BEATLEY has been appointed Superintendent of the People's gas works, of Brooklyn, N. Y., a position held by him several year's ago.

MR. WILLIAM TARBELL, of Waltham, Mass., has been appointed Constructing Engineer for the Company which is erecting the new plant at Laconia, N. H.

THE Detroit Gas Company will greatly extend its mains this summer, the intention of the managers being to put down at least 50 miles of pipe. The dollar rate takes effect there on July 1st. Meanwhile the Company's new President, Mr. Lynch, seems to be the right man in the right place, for he is conservative without being tainted with old-fogyism, and is progressive, but not radically so.

A FIRE which broke out in the blacksmith shop of the Newell Coal and Lumber Company, Pawtucket, R. I., at one time threatened the electric annex of the Pawtucket Gas Company with destruction, but no serious damage resulted. The fire, however, did cause the stoppage of the local street car service, the current for the moving of the cars being furnished by the Gas Company.

GOVERNOR FLOWER has signed the measure known as the Robertson bill, which provides for a park on the site bounded by 111th street, First avenue, 114th street and East river, this city. This will mix things up badly for the Consolidated Gas Company, since the plot selected will take from it the engine, exhauster, scrubber and purifier houses of its Harlem station. In fact, all that will remain will be the generator houses and the gasholders. Of course, the bill provides for the appointment of commissioners to condemn and appraise the property, and it will be of interest to the fraternity at large to watch the action of the commission, in so far as their estimate of the factors which go to make up the real value of the property to the Company is concerned.

AT the annual election of the Richmond (Ky.) Water and Light Company, held May 12, 1894, Messrs. A. E. Boardman, J. A. Sullivan, J. H. Powell, Thomas C. Woodbury, E. H. Yorke, M. N. Driggers and Chas. S. Powell were elected to the Board of Directors. The Directors subsequently elected the following executive management: President, Chas. S. Powell; Secretary and Treasurer, J. H. Sullivan.

THE Minneapolis (Minn.) Gas Light Company evidently acknowledges the right of the city to fix the price of gas, under the ordinance recently passed by Councils referring the matter to a Board of Arbitration, the same to be composed of three members, as witness the following communication forwarded by the Company to the City Attorney on the 19th inst.: "The Minneapolis Gas Light Company admits the right of the city of Minneapolis to fix the price of such gas as is used by that corporation known as the city of Minneapolis, by arbitration, as provided in sections 3 and 4 of that ordinance, granting to certain persons the right to manufacture and sell gas to the city of Minneapolis, approved February 24, 1870; and in accordance with your communication to this Company, dated May 15, 1894, we hereby appoint W. J. Murphy, of the Minneapolis *Tribune*, as the arbitrator on behalf of this Company.—H. W. BROWN, President."

MR. W. J. MURPHY, the Company's arbitrator, besides being a newspaper man (he is the Manager of the *Tribune*), was prominently identified with the Gas and Electric Light Company of Grand Forks, N. D., and also with the Gas Company at Crookston, Minn. Perhaps we went a trifle too fast in asserting that the Company acknowledged the entire right of the municipality to regulate gas rates to public and private consumers; for it will be noted the assent to arbitration stipulates virtually that the same shall apply only to "such gas as is used by that corporation known as the city of Minneapolis."

THE celebrated Mr. William Wilsdon, who it will be remembered some years ago tramped, actually tramped through the Western country inspecting gas meters for private account, has again appeared in his favorite character, this time at Cleveland, O., where his career is likely to be cut very short. The Company ought to be able to take care of him, and a search through the files of the JOURNAL of some eight or ten years ago might give them aid and comfort in settling him.

THE exhibition of gas appliances, held in connection with the 17th annual meeting of the Western Gas Association, was undoubtedly the most extensive and interesting display of the kind in question ever held in this country, and too much credit for it cannot be given to those who had charge of designing and carrying out the display. The exhibition room was all that the JOURNAL claimed for it some weeks ago, in that it was spacious, was located on the ground floor and directly opposite the Association headquarters and assembly room in "The Hollenden." The room, which was rectangular in shape, for the purposes of the display was spaced out with four aisles, all terminating in a raised platform at the end, the platform being devoted to a very handsome exhibit of the Welsbach Company. Along the aisles were arranged the exhibits of the Schneider & Trenkamp Company, Messrs. Helme & McIlhenny, J. J. Griffin & Co.—both of which concerns showed samples of automatic prepayment meters—the Ludlow Valve Mfg. Company, the Bristol Company, the Maryland Meter and Mfg. Company, George Shepard Page's Sons, the Greenpoint Chemical Works, the Western Gas Construction Company, the P. H. & F. M. Roots Company, the Metric Metal Company, the George M. Clark Company and many others. The display of stoves, ranges and heaters was exceptionally fine and indisputably complete, and amply proved that the manufacturers of this line of goods have made wonderful strides toward perfection, both in the matters of perfecting the finishing of the goods and to the equally desirable end of putting them on the market at remarkably low prices. The exhibition was well attended, not only by the delegates but also by residents of the city, who were freely welcomed.

MR. ALTEN S. MILLER has been appointed Superintendent of the manufacturing department of the East River Gas Company, with headquarters at Long Island City, N. Y.

THE Hartford (Conn.) *Courant* of recent date says that the plans for the increase of the capital stock of the Hartford Electric Light Company have been perfected. Four new shares may be had at par by each holder of 10 old shares, which means an increase in the stock of $100,000, or to $350,000, instead of the present capital of $250,000. Books for subscription open to day and close at the end of a fortnight. Payment may be made immediately, in which case subscribers are entitled to 6 per cent. interest, or the settlement may be made in four instalments of 25 per cent each, in May, August 10, October 10 and January 10.

SOME time ago we reported that the Norwalk (Conn.) Gas Light Company had brought suit against the city for damages to the Company's main system occasioned by the city while constructing a certain line of sewer. The damages were put at $1,071.15, which included interest and other relevant items. After some legal proceedings (which by the way cost the city treasury something like $1,200) the City Council finally directed that the following compromise be made: *Resolved*, That the suit of the Norwalk Gas Light Company against the city be settled by the city paying to the Norwalk Gas Light Company the sum of $750.85, with interest from May 1, 1888, and one half of the total costs of the suit, upon condition that said Gas Light Company give to the city a release in full of all claims for damages of any nature by reason of the acts complained of in said action.

AT the annual meeting of the shareholders of the Spokane Falls (Wash.) Gas Light Company, the following officers were elected: President, Jacob Moore, vice Thos. C. Hopper, deceased; Vice-President, Thos. C. Griffiths; Secretary and Treasurer, A. D. Hopper; Supt., E. L. Hopper. A discount of 10 per cent. was determined upon to all consumers who settle their bills at the Company's office previous to the 10th of the month.

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MONDAY, MAY 28, 1894.

The Market for Gas Securities.

The tendency in Consolidated during the week was downward, the opening quotation today (Friday) being reported at 135¼ to 135½, which is a loss for the seven days of 1½ points in the asking price. This unsettling of values can be attributed to nothing else than the cutting of rates in the "annexed district" of New York, and over the river in Brooklyn. Other city shares are also weaker, notably Equitable. The signing by the Governor of the new East Side Park bill has much of moment for the Consolidated Company, in that it will virtually cut its Harlem station in half. This means much more than the disabling of that plant, for the Company had sufficient ground there to construct a works of great magnitude. In fact, the proposed plant had been theoretically mapped out. We will await with much curiosity the value placed upon the plant by the commission that will condemn it. Brooklyn shares furnish a plethora of asking quotations, but bid prices are difficult to obtain. Meanwhile the rate fiasco goes on. Chicago gas sold up as high as 71¼ this week, and opened to-day at 70⅝ bid; and the rise is noteworthy in that it was accomplished in the face of a ragged and weak general market. Baltimore Consolidated is selling at 62½ to 62¾, ex-div. The market for outside shares is generally in favor of investors, and we think that Bay State common is a likely purchase at the ruling figures. A remarkable feature of the miscellaneous list is the tenacity with which the rise in Consumers, of Jersey City, has been maintained.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
16 WALL ST., NEW YORK CITY.

MAY 28.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share. ☜

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	135¼	135½
Central	500,000	50	100	—
" Scrip	220,000	—	100	—
Equitable	4,000,000	100	185	188
" Bonds	1,000,000	—	106	108
Metropolitan, Bonds	658,000	—	108	112
Mutual	3,500,000	100	150	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	80	95
" Bonds	150,000	—	—	100
Richmond Co., S. I.	348,650	50	50	—
" Bonds	100,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	—	31
Preferred	5,000,000	100	76	78
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	—	105
Citizens	1,200,000	20	50	—
" S. F. Bonds	320,000	1000	—	101
Equity Gas Light Co	2,000,000	100	—	—
Bonds	1,000,000	—	—	—
Fulton Municipal	3,000,000	100	128	—
" Bonds	300,000		103	—
Peoples	1,000,000	10	—	68
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	98	100
Metropolitan	870,000	100	127	—
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	—	160
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	130	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Bay State Gas Co.—				
Stock	5,000,000	50	15½	16
Income Bonds	2,000,000	1000	60	—
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	78	—
2d " " "	3,000,000	1000	57	58
Buffalo Mutual, N. Y.	750,000	100	121	125
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	70⅜	70½
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	81⅛	81½
Consumers Gas Light Co., Jersey City	2,000,000	100	44	—
Bonds	600,000	1000	85	—
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	184½	187
Central, S. F., Cal			—	100
Capital, Sacramento, Cal			—	55
Consolidated, Balt.	11,000,000	100	62¼	62¾
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
Detroit Gas Co.—				
Con. Bonds	.....	.....	65	70
East River Gas Co., Long Island City	1,000,000	100	—	—
Bonds	500,000	100	89¼	—
Equitable Gas & Fuel Co, Chicago, Bonds	2,000,000	1000	—	101
Hartford, Conn	750,000	25	120	128
Jersey City	750,000	20	190	200
Louisville, Ky	2,570,000	50	125	130
Laclede Gas Light Co. St. Louis, Mo.—				
Common Stock	7,500,000	100	16	17
Preferred "	2,500,000	100	69	72
Bonds	9,034,400	1000	85½	86
Little Falls N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
New Haven, Conn		25	200	—
Oakland, Cal			42⅝	43
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Peoples, Jersey City		—	160	170
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	80	85
Preferred			90	95
Bonds			90	95
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co.				
San Francisco, Cal	10,000,000	100	65½	66
Washington, D. C	2,000,000	20	240	—
Wilmington, Del	500,000	50	180	182

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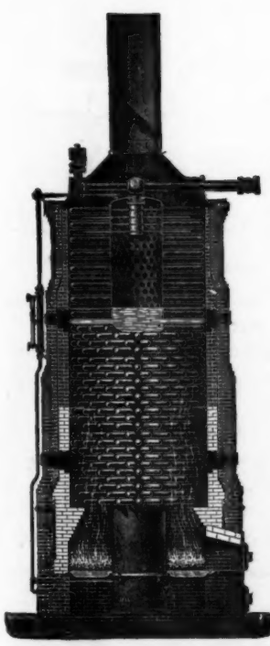

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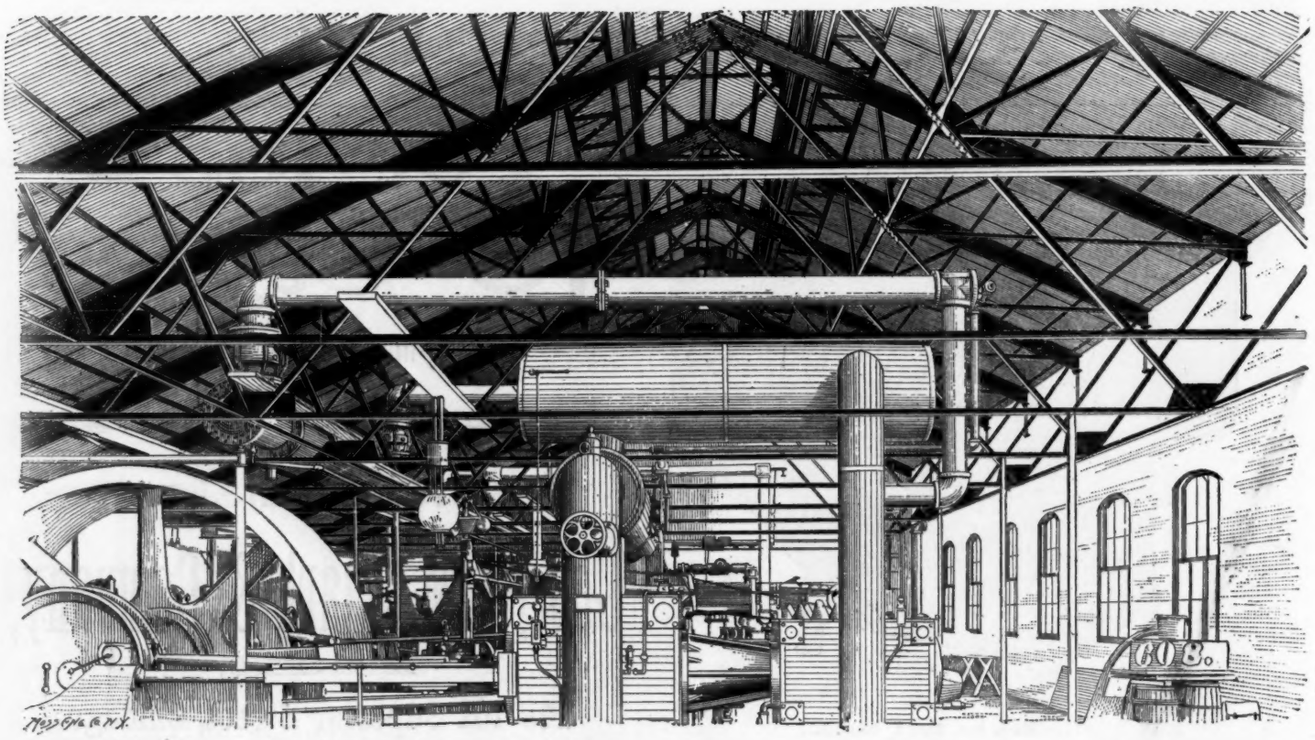

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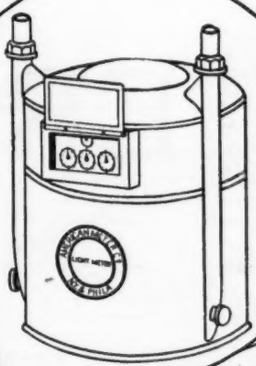

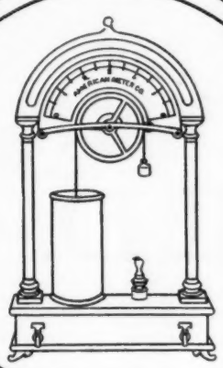

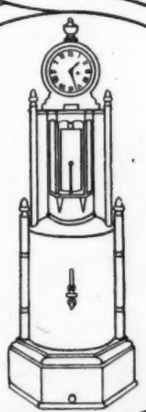

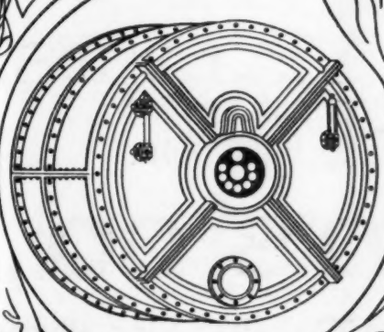

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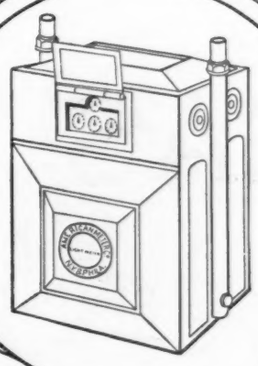
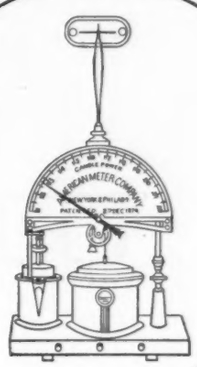
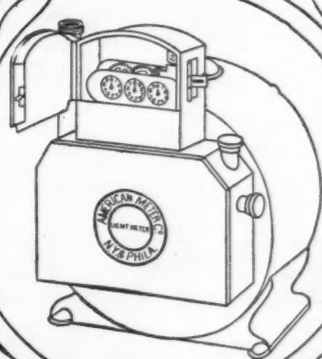
				P.M.	A.M.
Fri.	1	7.50 PM	3.30 AM	7.15	3.15
Sat.	2	7.50	3.30	7.15	3.15
Sun.	3	7.50 NM	3.30	7.15	3.15
Mon.	4	7.50	3.30	7.25	3.15
Tue.	5	7.50	3.30	7.25	3.15
Wed.	6	7.50	3.30	7.25	3.15
Thu.	7	8.00	3.30	7.25	3.15
Fri.	8	10.50	3.30	7.25	3.15
Sat.	9	11.20	3.30	7.25	3.15
Sun.	10	11.40 FQ	3.30	7.25	3.15
Mon.	11	12.00	3.30	7.25	3.15
Tue.	12	12.30 AM	3.30	7.25	3.15
Wed.	13	12.50	3.30	7.25	3.15
Thu.	14	1.20	3.30	7.25	3.15
Fri.	15	1.50	3.30	7.25	3.15
Sat.	16	No L.	No L.	7.25	3.15
Sun.	17	No L.	No L.	7.25	3.15
Mon.	18	No L. FM	No L.	7.30	3.15
Tue.	19	8.00 PM	10.10 PM	7.30	3.15
Wed.	20	8.00	10.50	7.30	3.15
Thu.	21	8.00	11.20	7.30	3.15
Fri.	22	8.00	11.50	7.30	3.15
Sat.	23	8.00	12.10 AM	7.30	3.15
Sun.	24	8.00	12.30	7.30	3.15
Mon.	25	8.00	12.50	7.30	3.15
Tue.	26	8.00 LQ	1.10	7.30	3.15
Wed.	27	8.00	1.30	7.30	3.15
Thu.	28	8.00	2.00	7.30	3.15
Fri.	29	8.00	2.40	7.30	3.15
Sat.	30	8.00	3.30	7.30	3.15

TOTAL HOURS LIGHTING DURING 1894.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	244.10	January	423.20
February	195.30	February	355.25
March	206.20	March	355.35
April	169.40	April	298.50
May	162.10	May	264.50
June	135.40	June	234.25
July	146.30	July	243.45
August	162.20	August	280.25
September	174.10	September	321.15
October	211.20	October	374.30
November	221.00	November	401.40
December	245.30	December	433.45
Total	2274.20	Total	3987.45







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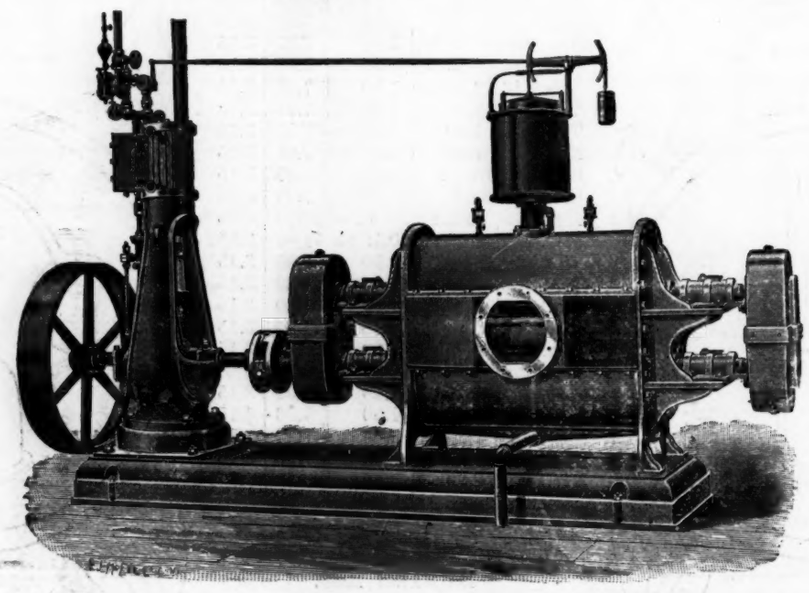

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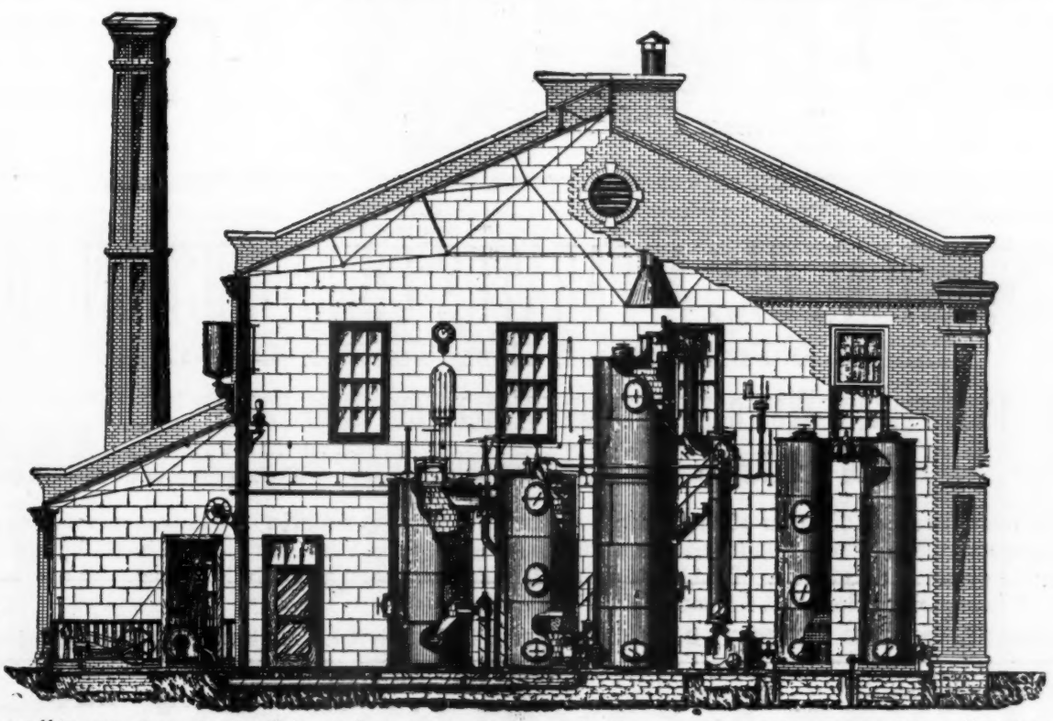

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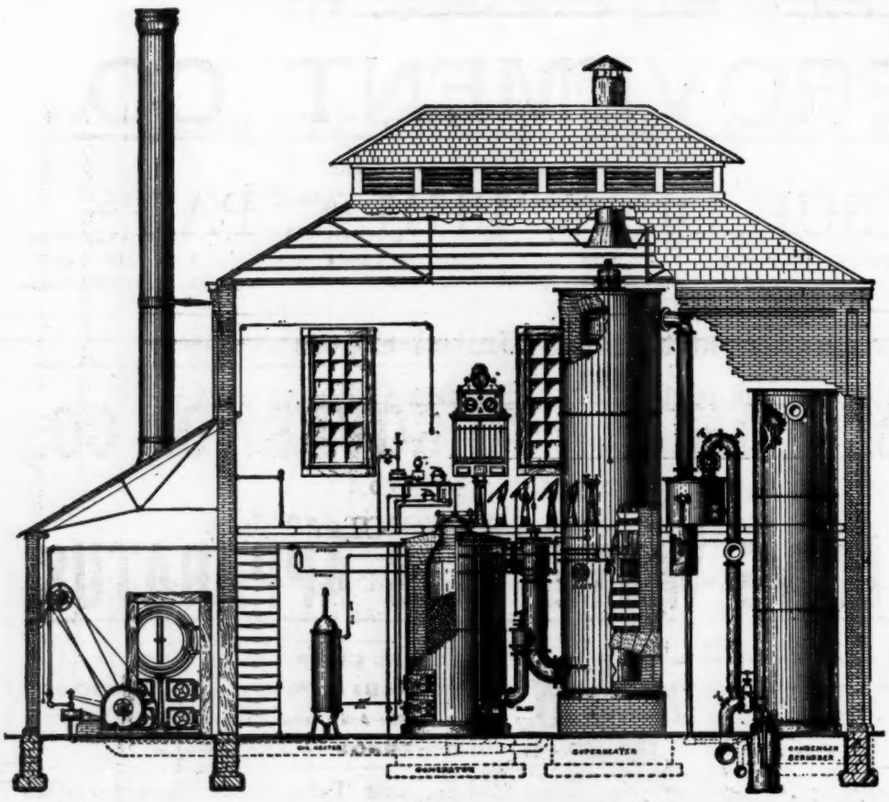

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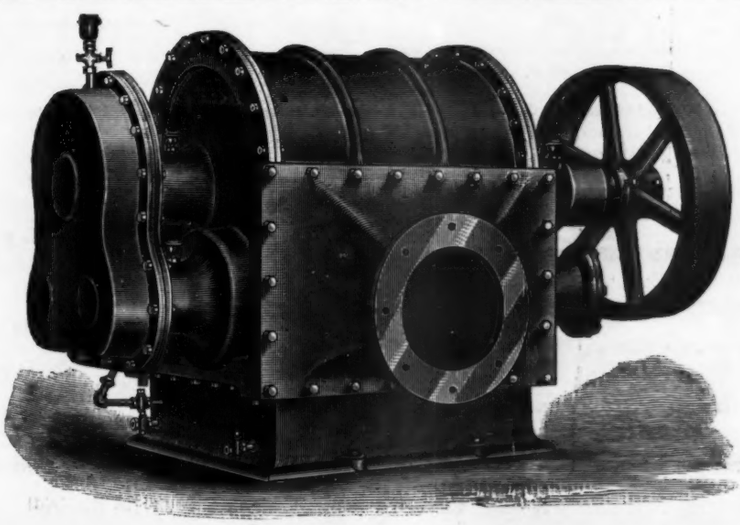

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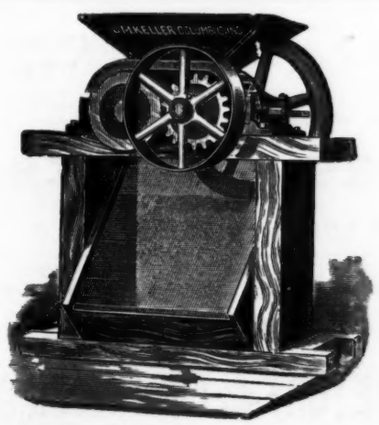

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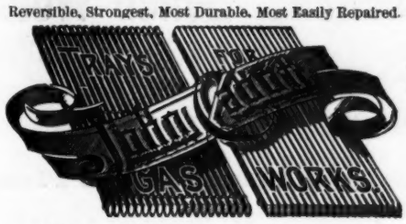

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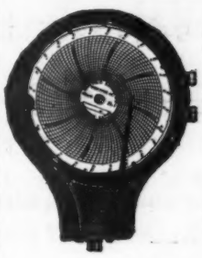

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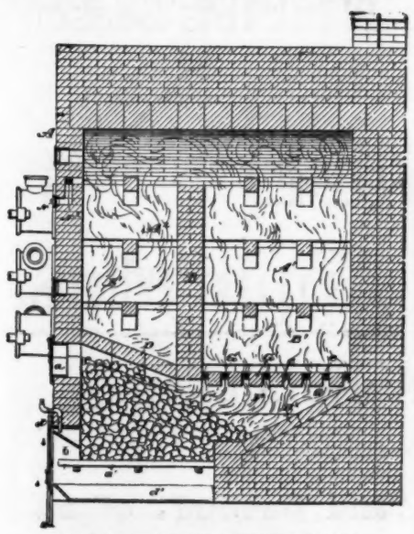

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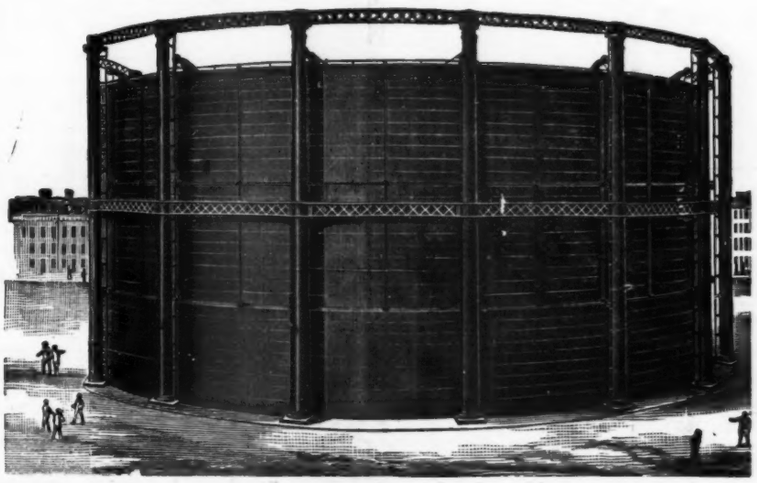

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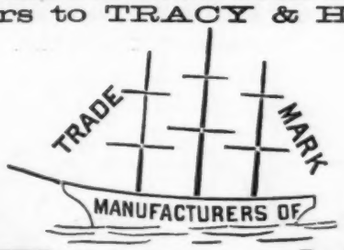

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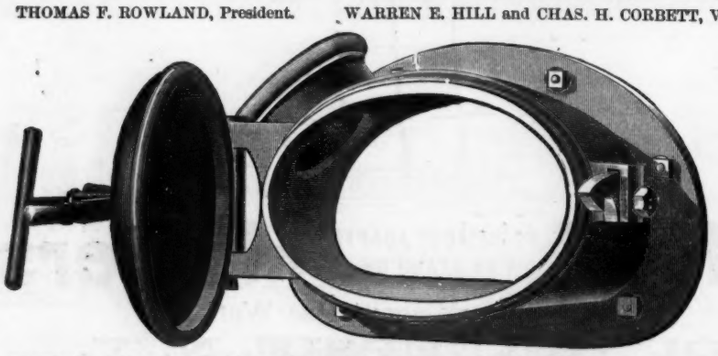

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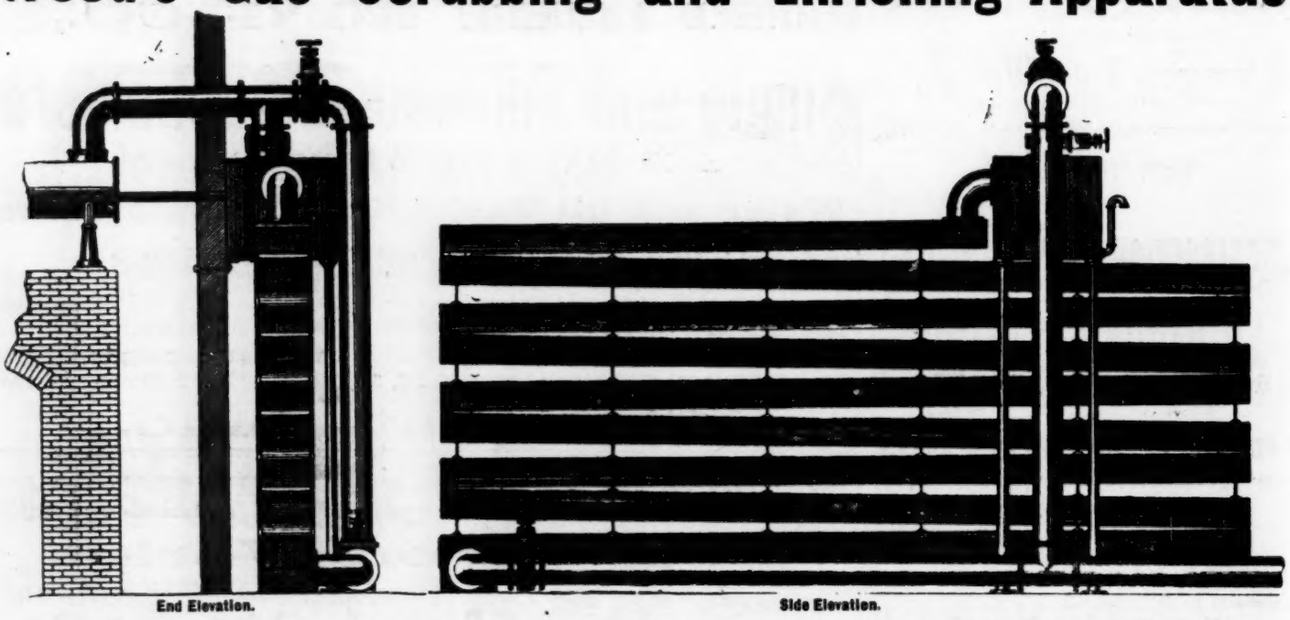

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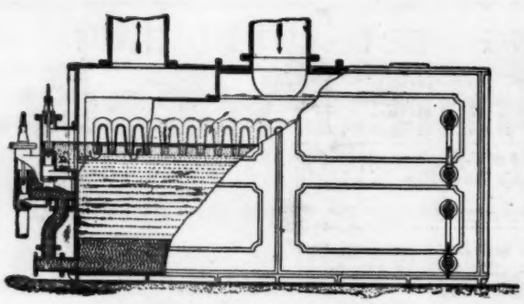

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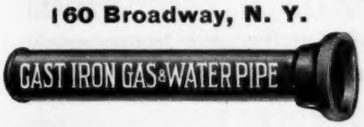

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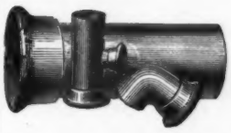

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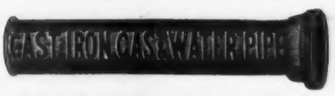

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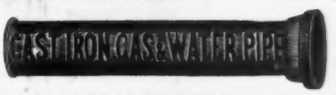

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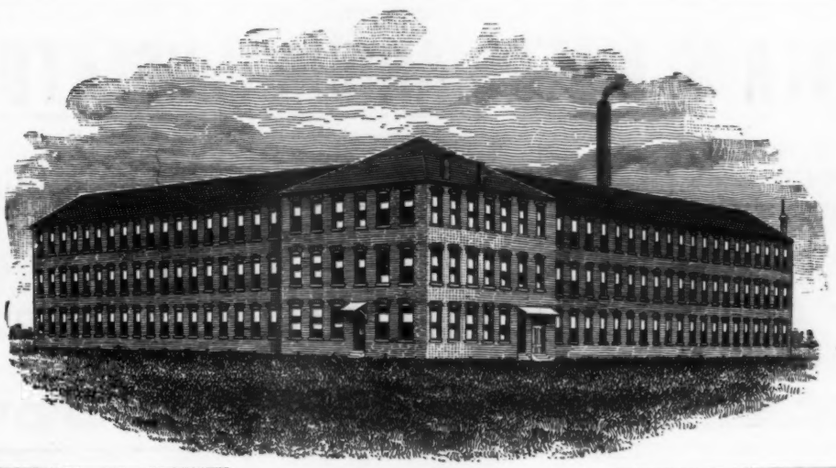

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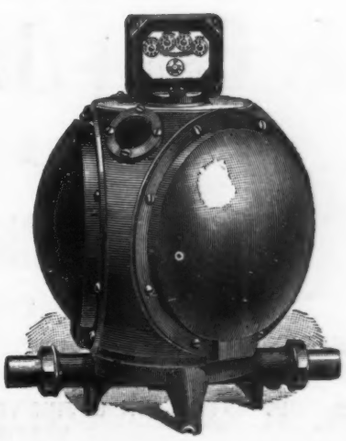

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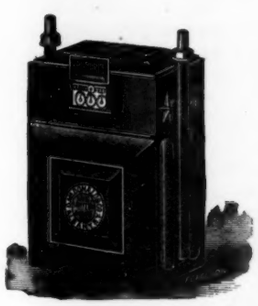

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The First to use the four-stroke cycle. **The First** to admit well measured and distinct charges of gas into an air space. **The First** in the adoption of poppet valves. **The First** to develop the tube igniter, with automatic or timed firing. **The First** to have a reliable electric and a practical magnectic igniter.

THE FIRST SMOOTH RUNNING & NOISELESS GAS ENGINE COMBINING EFFICIENCY & SIMPLICITY.

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With removable seats and casings for all valves.

With Patent Alloy Tube, good for one year.

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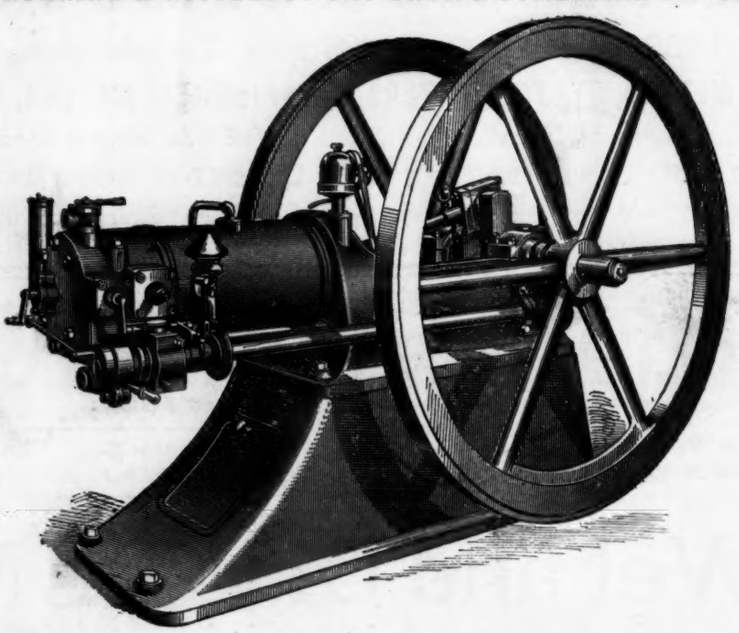

SIMPLICITY, as far as is possible, with good design and perfect Working. Built on scientific principles, with a view to **HIGHEST EFFICIENCY**

Sizes,
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The First and Only Engine To-day to Please Every Purchaser.

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It is almost a quarter of a century since the "Otto" revolutionized old and bad practices by introducing principles of combustion "entirely new" in the construction of Gas Motors.

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The experience of the past shows that it requires years to determine the real merits of a gas engine, and that nearly all new gas engines prove failures. **The fittest survive, and the only safe thing to do** in selecting a gas engine is to buy what the tests of practical use, through a long period of time, have proven to be the best.

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For simplicity of construction and grace in design; for general reliability and ease of management; for quiet and smooth running qualities; for efficiency and low gas consumption; for regularity of speed and close regulation of power.

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